YOUR GUIDE TO HEALTH

IN THE TROPICS

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YOUR GUIDE TO HEALTH IN THE TROPICS

By
Lieut.-Col. M. S. IRANI,

F.R.C.S. (Ed.), I.M.S. (Rtd.)

43 Illustrations

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PUBLISHER'S NOTE

This is the first volume by Lt.-Col. Irani of a contemplated Series of 3 volumes. The second will follow at an early date. It will deal with common diseases and their treatment.

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PREFACE

The books of this series are not intended as a substitute for the doctor, but are meant to impart useful knowledge to the layman of some important diseases and accidents commonly met with, how to prevent them and how to deal with them in the absence of medical help or pending the arrival of the doctor. Very often some minor symptoms, which are a danger signal or precursor of a serious trouble, are apt to be neglected till it is too late. Similarly, in case of accidents, which have, unfortunately, become too frequent under the present conditions of civilized life and rapid locomotion, a good deal of harm is usually done to the unfortunate victim by willing but ignorant friends and bystanders, when a little precaution or early administration of the right kind of first aid would not only make him comfortable until medical help is available, but prevent further complications and might be the means of saving his life. This book is written mainly for this purpose.

As a result of constant and intensive scientific research, Western medical science is progressing by leaps and bounds and almost every day some new epoch-making discovery is being made. Many diseases which only a short while ago were considered dangerous or incurable, have been brought under control and the mortality rate of many has been reduced to a vanishing point. But, for successful treatment, not only very early medical help, but the intelligent co-operation of the patient is also very necessary. This is possible if the patient has some knowledge of the principles of the art of healing. Unfortunately in India a good deal of ignorance prevails on the subject, as a result of which many irregular practitioners and quacks thrive to an incredible extent, whose qualifications to practise medicine are boundless audacity, a glib tongue, and spurious but plausible arguments and often catching advertisements which cannot fail to appeal to suggestible and ignorant persons. It is hoped this book will diffuse a little helpful knowledge of this important subject.

The treatment of diseases and accidents has been given in some detail so as to enable the reader to follow intelligently the line of treatment adopted by the doctor and co-operate with him, and in his absence enable him to help the patient as much as possible under the circumstances. In India, which is mostly a rural country where there is a great scarcity of doctors, this book will be of much use to those who have to travel a good deal, or those who have to live far from cities, in places where medical help is not available, such as government servants, planters, missionaries and others. It is hoped this book will be of some use to the nursing profession also.

By following the instructions carefully the reader will be able to dispense prescriptions and adopt certain therapeutic measures in places where facilities for such do not exist. The difficulty for the layman would be to diagnose, as without a correct diagnosis the administration of proper remedies is not possible. The ability to diagnose correctly depends not only on a thorough knowledge of all the diseases and the symptoms produced by them, but also on the use of many instruments and appliances, such as the stethoscope, microscope, test tubes, chemical reagents, x-rays, etc., and even with all these, mistakes are liable to occur occasionally. By referring to the symptoms described in the book the reader will be able to find out in which particular diseases these occur, and by referring to these diseases he will have some idea of the nature of the trouble , failing that he will be able, in the absence of the doctor, to treat the symptoms and make the patient as comfortable as possible under the circumstances.

In dispensing great care is necessary so that the right drugs and correct weights are used. Similar precautions, as regards the spelling of drugs, are to be strictly observed when a prescription is copied from the book to be dispensed by the chemist as wrong drugs might be mixed which might produce a disastrous result. On one occasion barium sulphide, which is a deadly poison, was dispensed through negligence for a patient, in place of barium sulphate with a fatal result. Barium sulphate is an innocuous chemical and being opaque to x-rays is used mixed with oatmeal porridge to fill the stomach before examination.

I am indebted to the St. John's Ambulance Association, London, for their kind permission to reproduce Fig. 7 in a modified form showing the Course of the Arteries from their text-book *First Aid to the Injured*, and to Miss Ernie Rustomji for many of the illustrations in the book.

M. S. I.

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CHAPTER 1

ELEMENTARY HUMAN ANATOMY, PHYSIOLOGY AND BACTERIOLOGY

Anatomy is the science of the structure of the body and the relation of its parts and organs to one another, and physiology deals with the normal functions of the living organism and its parts. In order to understand the diseases of different organs and parts of the body and to render first aid in an emergency, some knowledge of anatomy and physiology is necessary. In the following pages a short description of these two sciences is given.

The human body consists of a bony skeleton (fig. 1) of about 200 bones of different sizes and shapes, muscles, organs, blood vessels, lymphatic glands and vessels, nerves and skin. The skeleton is the framework which supports the soft parts, protects organs and is useful in locomotion. The movements of the limbs and locomotion are effected by muscles. The skeleton is divided into three parts: (1) the head which consists of the hollow skull and the bones of the face; (2) the body consisting of the spine, ribs, breast bone and pelvis, and (3) the extremities or the upper and lower limbs.

The *skull* is a large hollow bony cavity which contains the most delicate organ, the brain. It is made up of several bones which are separate at birth and present large gaps called *fontanels* at the top of the head in front and behind which can be felt in the new-born and which begin to fill up after birth and disappear during the second year of life in a healthy infant. The bone in front which forms the forehead is called the *frontal bone*, the one forming the back of the head is the *occipital bone*; these two do not extend as far as the top of the head which is formed by the union of two curved bones called *parietal bones*, extending from each side as far as the top. The temple on each side is formed by the *temporal bone*; the lower and thick part of this bone, which forms a part of the base of the skull contains the middle and the inner ear and a small organ called *semicircular canals* consisting of three small bony canals of that shape. This organ is responsible for maintaining the balance of the body while walking or standing. The *base of the skull* is formed by the lower parts of the frontal, occipital and temporal bones. The brain rests on it and it has several openings to allow the passage of nerves, blood vessels and the spinal cord.

The *upper jaw* consists of two bones, one on each side, which are fixed to the base of the skull, each bone having eight teeth in adult life. The gap between them forms the nasal cavity, which is divided into two by a thin partition of bone and cartilage known as the *septum of the nose*. The arched vault of the nose is formed by two *nasal bones* which cover the front of the nasal cavity and to whose lower margin thin soft pieces of cartilage are attached which give the nose its characteristic shape and form the nostrils. The joint between the skull and the spine allows the head free movement in all directions.

The *lower jaw*, also called the *mandible*, is shaped like a horseshoe, the ends of which are turned upwards at the angle of the jaw. Each end has an articular surface which forms a movable joint with the

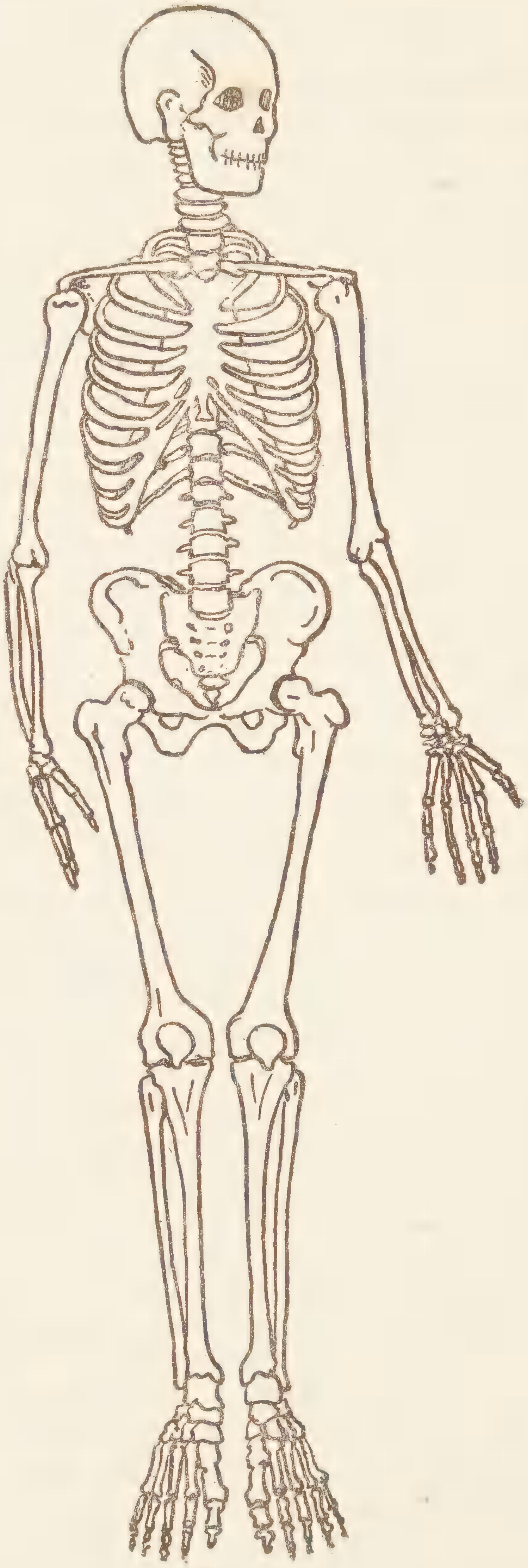


FIG. 1

Human Skeleton. It is made up of 200 bones.

temporal bone. A flat process of bone projects in front from the vertical part and to these are attached the muscles which move the jaw for mastication and speaking. There are sixteen teeth in the mandible, corresponding to those in the upper jaw.

The *spine* (fig. 2) is a flexible column composed of thirty-three more or less cylindrical pieces of bone called *vertebrae*; the first seven, named the *cervical*, form the neck; the next twelve, called the *thoracic*, form the back part of the chest and to each of these is attached a rib on each side ; the next five, called the *lumbar*, are the thickest and strongest as they have to support the greater part of the body; the next five are firmly united together forming one curved wedge-shaped bone called the *sacrum* which forms the back part of the pelvic cavity. The remaining four small bones form one piece called the *coccyx*, which is the rudimentary tail in the human being.

Each vertebra consists of a solid body and a thin but strong bony arch behind. All the arches form a canal, from one end of the spine to the other, through which the *spinal cord* passes from the brain to the lower part of the spine where it breaks up finally into the last batch of nerves. A fairly thick elastic disc of soft cartilage is placed between the vertebrae, which not only holds them together but also acts as a soft pad to take off all jars and shocks imparted to the body while running or jumping and give elasticity to the whole column.

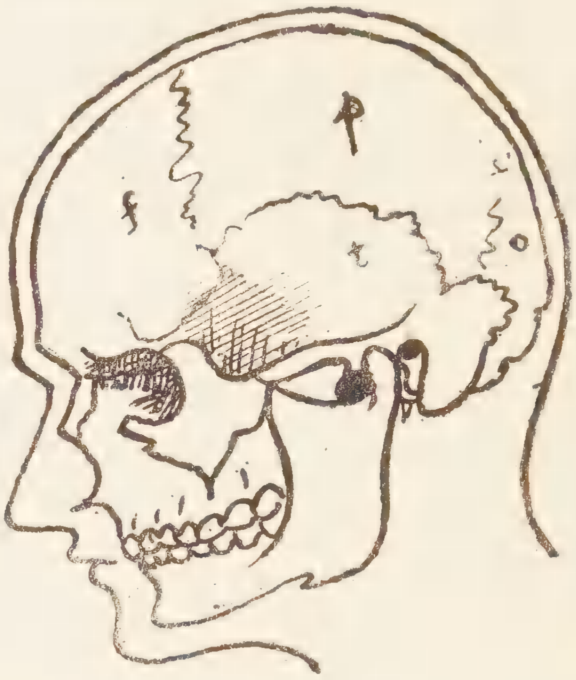
The *thoracic cavity* is formed by twenty-four ribs, twelve on each side. The rear end of each is attached to the body of the thoracic vertebra, and the front end fixed to the *sternum*, i.e., the breast bone, the first seven joining it separately through cartilagenous prolongations and the next four uniting together before they reach the sternum. The cavity thus formed is called the *thoracic cavity* or the *thorax*. Its bottom is formed by a thin muscular partition called the *diaphragm* which separates the thoracic from the abdominal cavity. The thorax contains the lungs, heart, large blood vessels, lower air passages and part of the gullet. The gaps between the ribs are bridged by thin muscles called *intercostal muscles*, and by fibrous membranes.

The *abdominal cavity* is bounded above by the diaphragm, on each side and the front by flat muscles, and behind by the spine and the muscles of the back ; below it is continuous with the pelvic cavity. It contains the stomach, intestines, liver, spleen, pancreas, kidneys, ureters, blood vessels, lymphatic vessels, and the glands and nerves.

The lower part of the body is called the *pelvis* or the *pelvic cavity*. It is continuous above with the abdominal cavity and closed below by muscles and ligaments. Its framework is formed by two strong irregularly shaped curved bones called *innominate*, i.e., nameless bones, which unite in front forming the *pubis*, while behind in the gap between them the sacrum is wedged so as to make a girdle known as the pelvic girdle (fig. 3). The pelvic cavity contains the last part of the large intestine, rectum, bladder, blood vessels to and from the lower extremities, nerves, and in the female the womb and ovaries. The size and the shape of the pelvis vary in the male and the female and it is possible to make out the sex from an examination of the skeleton.

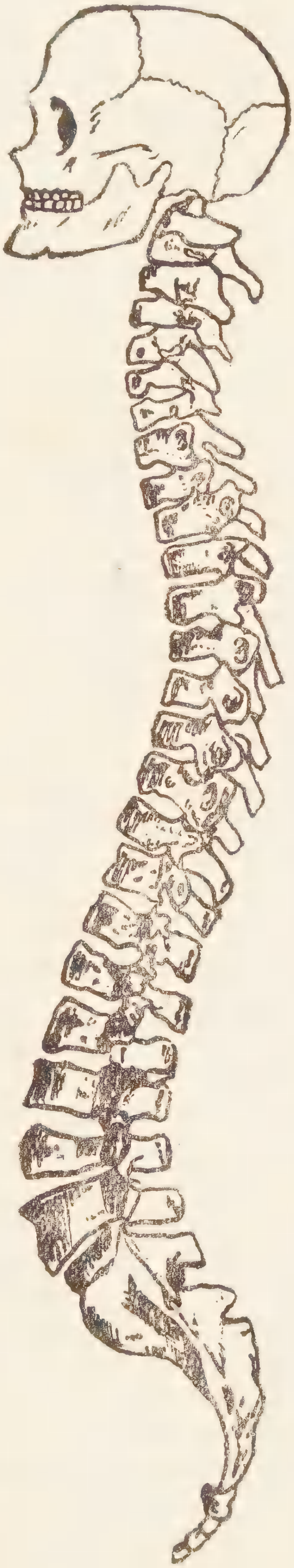
The bones of the upper extremity are the *scapula*, i.e., the shoulder-blade, *clavicle*, i.e., the collar bone, *humerus*, i.e., the arm bone, *radius*

FIG. 2



B

The bones of the skull. f-frontal, p-parietal, t-temporal, o-occipital.



A

Side view of the spine. It is made up of 33 pieces of bone, 7 cervical, 12 ordsal, 5 lumbar, 5 sacral, and 4 coccygeal.

and *ulna*, the two bones of the forearm, *carpus*, i.e., the wrist bones, *metacarpus*, i.e., the bones of the palm and *phalanges*, i.e., the bones of the fingers. The two collar bones in front and the two shoulder blades behind form an incomplete girdle which is called the *shoulder girdle*.

The *scapula* is a flat triangular piece of bone situated on the upper and back part of the thorax. Its upper and outer end forms the shoulder joint with the head of the arm bone. The outer end of the collar bone, which forms the tip of the shoulder, forms a joint with a projection of bone from the scapula.

The *clavicle* is placed horizontally, one on each side at the root of the neck in front, its inner end resting on the top of the breast bone. In shape it is like the letter *f*. It is placed just under the skin and can be felt throughout its whole length. It sustains the weight of the arm in various positions and is very liable to injury on account of its exposed position, and is the most frequently fractured bone in the body.

The *humerus* is a long, more or less cylindrical bone. Its upper globular end forms the shoulder joint with the scapula. Its lower end forms the elbow joint with the upper ends of the two bones of the forearm. It is also frequently fractured either from direct or indirect violence. It is sometimes fractured by sudden muscular effort as in throwing a ball.

The *ulna* and the *radius* are the two bones of the forearm, the former being situated on the inner side in line with the little finger. Both of them take part in the formation of the elbow joint, while the lower end of the radius alone forms the wrist joint with the wrist bones. This arrangement allows pronation and supination of the forearm.

The *carpus* are eight in number, arranged in two rows of four each. These bones are firmly fixed and are not liable to be injured, but may get dislocated. The five long bones in the palm are called *metacarpus* and those of the fingers *phalanges*, there being three in each finger and two in the thumb.

The bones of the lower extremeties are longer and stronger than those of the upper having to sustain the weight of the body. The lower extremity has three segments, the thigh, the leg and the foot, the corresponding bones being the *femur* in the thigh, *tibia* and *fibula* in the leg, *patella*, i.e., the knee cap, *tarsus* and *metatarsus* in the foot, and *phalanges* in the toes.

The *femur* is the longest and strongest bone in the skeleton, its length being one-fourth the height of the body. From its upper end projects at an angle what is called its neck, which is surmounted by a globular head. The head forms the hip joint with a round cavity on the side of the innominate bone. The whole weight of the body is transmitted through the neck which is very strong. In old age when all the bones become brittle the neck of the femur is very liable to be fractured from the least jar when the weight of the body is suddenly thrown against it. The lower end of the femur forms, with the upper end of the tibia and the kneecap, the knee joint. Two soft elastic crescentic pads called *semilunar cartilages* are placed in the joint between the ends of the bones, which act as shock-absorbers while running or jumping. They are very liable to injury, especially the one on the inner side, and are often torn when the knee is subjected to sudden and violent movement or twisting as happens in violent games.

The *patella* is a flat triangular piece of bone situated in front of the knee joint and within the tendon of the large muscle in front of the thigh. This bone is very liable to break from muscular action. It is also liable to direct injury on account of its exposed position.

The *tibia* and *fibula* are two bones of the leg, the former being thicker and stronger and takes part in the formation of the knee joint above and the ankle below. The fibula is on the outer side and at the ankle it forms the outer projection forming part of the ankle joint. The inner projection is formed by the tibia. These prevent the lateral dislocation of the ankle ; however either is liable to break under great stress.

The *tarsus* bones are seven in number. The largest forms the protection of the heel. All these are kept together by means of strong ligaments, and with the metatarsal bones form the *arch of the foot* (fig. 4)

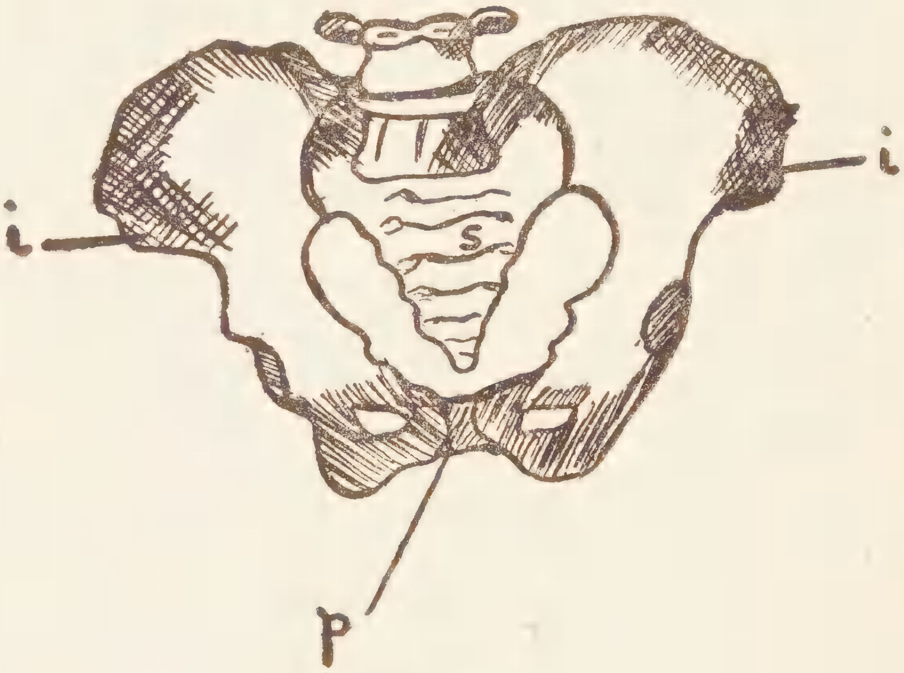


FIG. 3

Human Pelvis. i, i—innominate bones, p-pubic bone, s-sacrum.

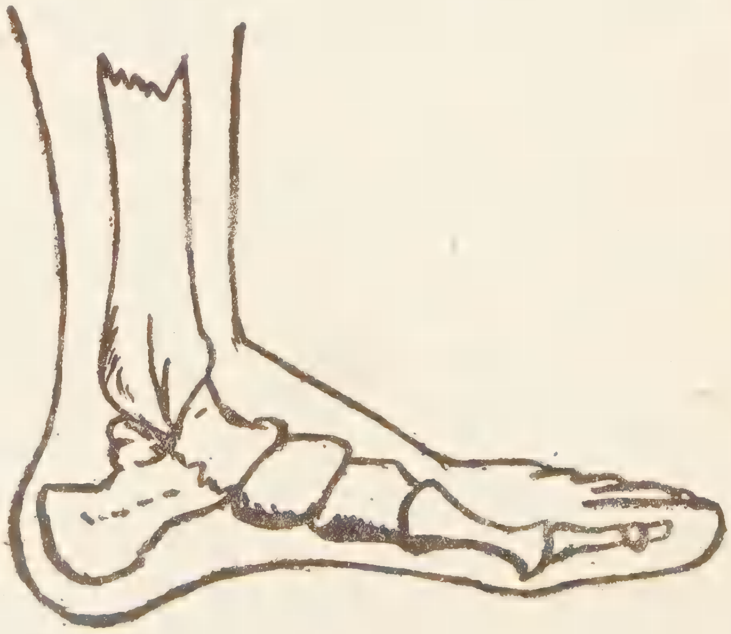


FIG. 4

Side view of the bones of the foot showing the arch, which in the living body is maintained by strong muscles and ligaments.

which gives spring and elasticity to the foot. When for some reason or other the ligaments and muscles supporting the arch lose their tone the arch gives way, forming the deformity called flat-foot.

The *metatarsus* are five in number and correspond to the toes. The number and arrangement of the *phalanges* are the same as in the hand, there being three for each toe and two for the great toe.

THE MUSCULAR SYSTEM

There are two kinds of muscles in the body, viz., the voluntary, which are under the control of the mind and contract at will—they are also called striated on account of the transverse markings on the fibres which make up the muscles ; and the involuntary or non-striated, which perform their function independently of volition. The former are the skeletal muscles, which have a dark red colour, and by their contraction produce movements of limbs and movable parts of the body, and are responsible for locomotion. The latter, or the involuntary muscles, are situated in the stomach, intestine, bladder, blood vessels, etc., and are of a much lighter colour.

A muscle is made up of a large number of small, red, elastic and contractile fibres, which, by their contraction, pull the two ends of the muscle together and bring about the desired movement. The muscles vary in size and shape according to the amount and nature of work they have to do. The origin of a muscle is from a fixed point and it terminates in a fibrous band, or sometimes in an elongated chord-like structure, called the *tendon* which is attached to a movable part. When a muscle is attached to the skin, the muscular fibres are spread out over a large area before the insertion takes place, as in the skin of the face, forehead, head and neck. The skeletal muscles are covered by a thin but strong fibrous sheath called *fascia* which protects and keeps them in their groove or place.

The muscles by their contraction produce energy and heat and need fuel or nourishment which is brought to them by the blood-vessels in the shape of glucose, a kind of sugar. When the muscle is at rest, the glucose is stored up in the muscle tissue in the form of muscle-starch, which is called *glycogen*, to be used when required. After physical exertion the stock of glycogen in the muscle is very much diminished, but is soon replaced by that circulating in the blood. In health, a fixed percentage of sugar is always present in the blood, and as it is taken up by the muscles during work, it is replaced from the great central store-house of sugar, viz., the liver, so as to keep up a constant level in the blood. The muscular fibres increase in size and number when the muscle is regularly and properly worked and adequately nourished, but when it does not get enough work, or is habitually over-worked and does not receive adequate nourishment, the fibres degenerate, become fewer and thinner, and the muscle loses in strength and size. Sufficient and regular exercise, proper nourishment and avoidance of overwork are necessary for keeping up the physical strength of the body and increasing the capacity for physical exertion to the maximum.

THE CIRCULATORY SYSTEM

This consists of its central organ, the heart, arteries, veins and a very fine network of minute channels called capillaries, and the blood circulating in them. Arteries take the blood from the heart to different parts of the body where they break up into small branches which ultimately end in the capillary network. These capillaries unite into larger branches and form veins which return the de-oxygenated blood back to the heart. Figure 5 is a diagram showing the scheme of circulation.

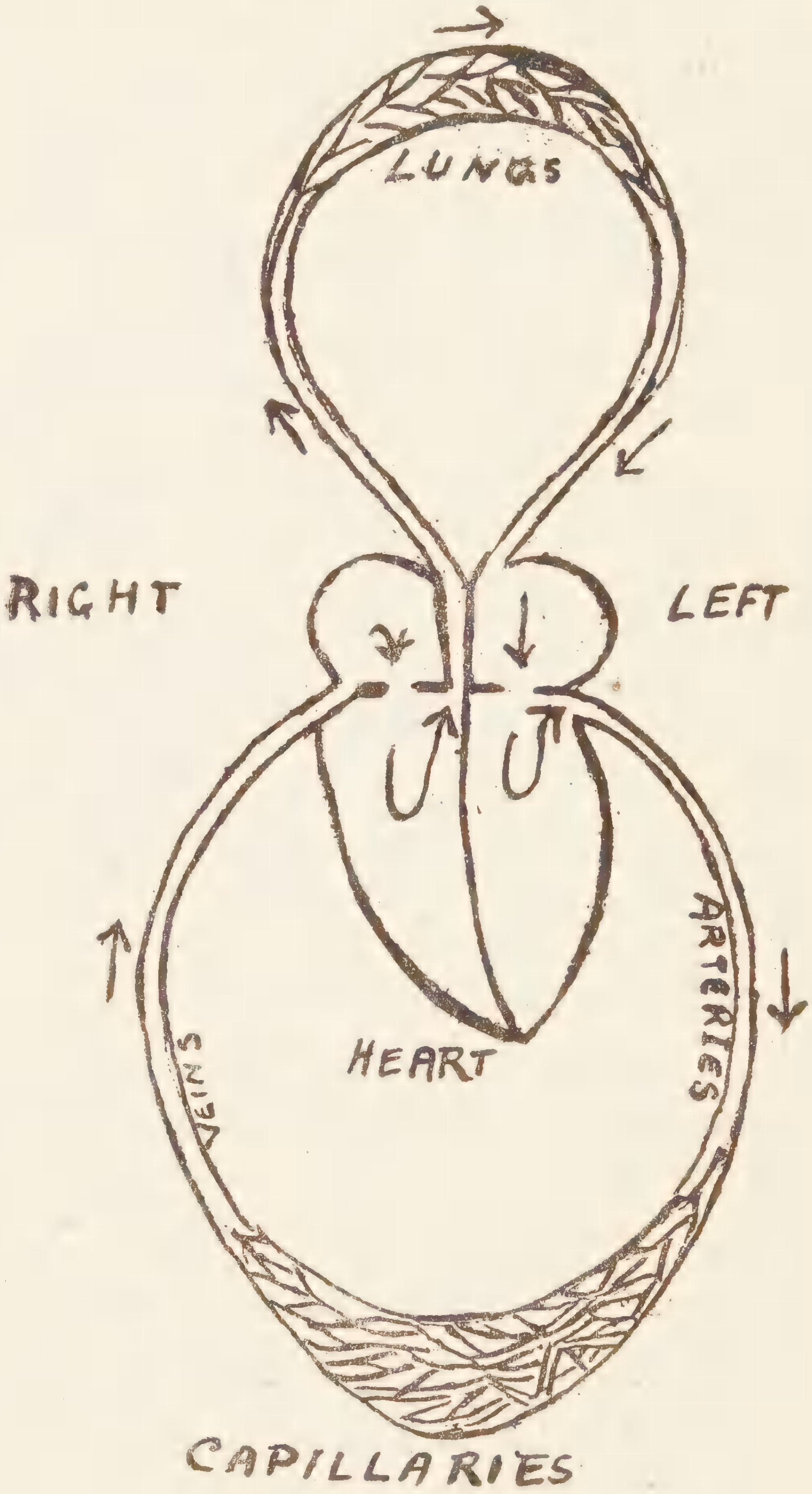


FIG. 5

Diagram showing the scheme of circulation. The arrows show the direction in which the blood flows. All the openings in the heart are provided with valves which allow the blood to flow in one direction only when it contracts.

The Heart. The heart is a hollow muscular organ of the shape of a cone, situated in the upper part of the thoracic cavity behind the breast bone and between the lungs by which it is partly covered. The base of the cone is roughly looking towards the right shoulder and the apex downwards in the opposite direction. About two-thirds of the organ is situated to the left of the middle line of the body. It is divided into two lateral halves by a muscular partition, which from their position are known as the right and the left side of the heart. Each half is again subdivided into two cavities by a transverse muscular partition, the upper being known as the *auricle* from its fancied resemblance to a dog's ear, and the lower as the *ventricle.* Two large veins, the upper and the lower *vena cava*, bring de-oxygenated blood from all parts of the body to the right auricle which passes it on to the right ventricle through an opening in the muscular paritition. From here it is sent to the lungs where it is oxygenated and returned to the left auricle, thence to the left ventricle which pumps it into the aorta which is the beginning of the arterial system.

All the openings in the heart where the blood-vessels enter or leave it and those in the muscular partitions, are well guarded by valves, which allow the flow of blood in one direction only. In valvular disease of the heart, one or more of these valves become incompetent and allow part of the blood to flow in the wrong direction.

The *aorta* is the main artery that originates from the left ventricle and soon after forms an arch called the *arch of the aorta ;* the arteries to the head and upper extremities are given off from the arch. It then descends on the left of the middle line and through an opening in the diaphragm enters the abdomen. After having provided the abdominal and pelvic organs with their blood supply it divides into two branches one for each lower extremity. The arteries going to the face and head are known as *carotid* arteries, and those to the upper extremities as *axillary* arteries. The main artery of the lower extremity is known as the *femoral.* These divide and subdivide and receive different names in different parts of the body ; that in the arm is called *brachial* which divides at the bend of the elbow into *radial* and *ulnar*, the former being in an exposed position just above the wrist on the lower end of the radius where its beats are felt as the pulse. The ulnar artery lies under muscles and its pulsations cannot be felt. Both these enter the hand where they join each other by means of two arches from which small arteries are sent to the fingers and other parts of the hand. On account of the free communication between these two through the arches, in case of a wound of either of them free bleeding takes place from both the cut ends.

From the thorax the aorta enters the abdominal cavity through an opening in the diaphragm and supplies branches to the organs and the walls of the abdomen. Lower down it divides into two main branches which send sub-branches to the pelvic organs and pass into the lower extremities. Here it is known as the *femoral artery ;* its pulsations can be felt just below the groin in the middle line. From here it runs downwards under the thigh muscles as far as the beginning of the lower third of the thigh where it turns to the back of the thigh and reaches the hollow space behind the knee ; here it divides into two, one supplying the front and the other the back of the leg. Both of these enter the foot where they unite in arches from which branches are sent to the foot and toes.

Almost all the branches given off by an artery intercommunicate with one another through minute branches, so that in case an artery is occluded by a ligature or in some other way, the circulation in the part below the point of obstruction is not completely stopped but is carried on through the minute communicating branches. This is known as collateral circulation. In course of time these branches increase in size so as to establish the normal blood supply to the parts below.

The Capillaries. The arteries divide and sub-divide into smaller and smaller branches and finally the small divisions break up into a microscopic network of channels called capillaries. Such a network is found in every part and organ of the body, and when any part is cut or damaged the blood that oozes out of the wound comes from the capillaries. In normal healthy persons the bleeding from the capillaries soon stops by itself as the tension in the capillaries is not high and the clotting of the blood that takes place effectively plugs them. The very thin walls of the capillaries are permeable and allow the nourishment and oxygen to pass out into the tissues, and the waste products from the tissues to enter the blood stream. Similarly the oxygen from the atmospheric air enters the blood circulating in the capillaries of the lungs, also the nourishment from the digested food is absorbed by the capillaries of the stomach and intestines. The waste products gathered from the tissues are taken to the excretory organs where they are removed from the blood. These capillaries unite into larger branches as they return towards the heart and form veins.

Veins. The veins carry the de-oxygenated blood back to the heart from where it is sent to the lungs. Their walls are thinner as the pressure of blood in them is much lower than that in the arteries. As they proceed towards the heart smaller branches unite to form larger trunks and finally only two, one from the lower parts of the body, viz., the *inferior vena cava* and one from the upper, the *superior vena cava*, reach the right auricle of the heart. They run close to and more or less parallel to the corresponding arteries and, as a rule, are placed more superficially ; many of these are visible under the skin running a tortuous course. Bleeding from a vein is easy to control on account of their superficial position and low pressure in them. The veins are provided with valves inside their lumen, which prevent the blood from flowing in the backward direction. Intra-venous medication is given directly into a vein which can be punctured through the skin with a special needle ; the superficial veins in front of the bend of the elbow are ordinarily made use of for the purpose, but any prominent vein on the surface may be used. The veins, as a rule, are named after the arteries, but those in the neck, corresponding to carotid arteries, are called *jugular veins.*

The Blood. The blood constantly circulates in the closed system of blood-vessels by the pumping action of the heart. It is the medium through which the nourishment and oxygen are carried to the tissues and organs of the body and on it also depends the secretion of certain glands, which is necessary for the proper performance of the functions of different organs and the growth of the body. It also carries away the waste products from the tissues to the excretory organs to be removed from the body.

The total quantity of blood in the human body is roughly between 5 and 7.5 per cent of the body weight. Any loss above three per cent of the weight is dangerous ; young and healthy persons can lose a larger quantity of blood without fatal results. The replacement of the lost blood is quick in healthy bodies.

The blood is composed of *plasma* or the liquid part, which is a thin clear yellowish fluid, and *corpuscles*, which float in the plasma in large numbers. There are three different varieties of them, viz., *white corpuscles*, *red corpuscles* and *blood plates*, each of which has a different function to perform. The red corpuscles, whose number is the largest, contain iron in the form of *haemoglobin*, which gives the characteristic red colour to the blood. It readily combines with the oxygen of the air when exposed to it as occurs in the lungs. In the tissues the oxygen is exchanged for carbon dioxide gas which is conveyed to the lungs where it is discharged into the air that is exhaled.

There are different varieties of white blood corpuscles, or *leucocytes* as they are called, and each has a different function to perform. Taken together they protect the body against bacteria or any foreign organism that invades it by attacking and destroying them. They take an active part in the repair of damaged tissues of the body, help in absorbing the digested food from the intestine and bring about the coagulation of blood which takes place outside the body. The known function of the blood plates is that they take a very active part in the coagulation of the blood.

THE LYMPHATIC SYSTEM

The lymphatic system consists of lymphatic vessels or lymphatics, lymphatic glands and lacteals which convey the *chyle* or the milk-white fluid product of digestion from the intestine to the blood. Lymphatics are very minute channals with thin white walls which are present in all parts of the body. They have valves which allow the flow of lymph in one direction only. All these unite and form two main trunks, one on the right side of the body and the other which is larger, on the left. These open into the vein on their respective side of the body near the root of the neck, where they discharge their contents into the blood stream.

The Lymphatic Glands. These glands are small round or oval solid bodies, greyish in colour and vary in size from a small pea to an almond, through which the lymphatics pass on their way to the blood stream. One of the functions of these glands is to strain the lymph passing through them and arrest bacteria or foreign matter that might be present in it and prevent them from reaching the blood. When the bacteria are not virulent they are destroyed and disposed of by the glands, but when they are able to overcome the local resistance they produce inflammation or suppuration in the gland and reach the circulation causing general infection ; the bubo of the bubonic plague is a familiar instance.

THE NERVOUS SYSTEM

The nervous system consists of the *brain*, *spinal cord*, *nerves*, and *ganglia* which are small collections of nerve cells scattered in different parts of the body.

The Brain. The brain is the most important and most delicate organ in the body. It is enclosed in the skull and is divided into four parts, viz., the *cerebrum* consisting of two halves, the right and the left; the *cerebellum* or the little brain which is situated in the back part of the head; the body at the base of the brain containing a large numbe of fibres joining the different parts, known as the *pons verolli ;* and the elongated upper part of the spinal cord situated in the skull, known as the *bulb* or the *medulla oblongata.*

The brain is made up of grey and white matter. The former situated on the surface, consists of nerve cells, and the latter is a collection of white elongated fibres or processes from these cells ; some of these come out through openings in the skull as nerves and the rest pass to the spinal cord. Through the former, which form twelve pairs of nerves called *cranial nerves*, the brain is directly connected with the sense organs, stomach, heart, lungs, and muscles and the skin of the head, face and neck. The latter pass down to the spinal cord where they come in contact with the nerve cells and through them control all the other parts of the body.

A small area on the surface of the brain is called the *motor area*, because the impulses which bring about voluntary movements of muscles or limbs, originate there. It is divided into different centres, each consisting of a group of nerve cells which are connected with and control the movements of a particular limb or part of the body. The group controlling any part, such as the lips, arms, legs, tongue, etc., is known as the centre for that part. All parts of the body are represented in the motor area. The centres situated on one side of the brain control the parts on the opposite side of the body, as the fibres from the brain cross over to the other side before they come out as nerves.

In the same way, sensation from all parts of the body is conveyed by nerves called *sensory nerves*, to the opposite side of the brain where it is really felt. The area of brain where the sensation is felt is known as the *sensory area.* All sensations of pain, pressure, temperature, sight, hearing, taste, and smell is felt in their respective centres in this area. The loss of sensation or motion in any part or organ may be due to an injury to the centre in the brain or to any part of the link between the two, viz., the spinal cord or the nerves.

The Cerebellum or the *Little Brain* is situated in the back part of the head below the brain, from which it differs in appearance, being made up of thin lamilae of grey matter separated by deep furrows. Its main function is to co-ordinate the complicated movements of equilibrium and locomotion. Any damage or disease of the organ results in giddiness and inability to carry out co-ordinated movements.

The Medulla Oblongata, also known as the bulb on account of its shape, is connected in front with the brain and is continuous behind with the spinal cord. It not only contains all the fibres passing from the brain to the spinal cord, but also has some nerve centres controlling the activities of the vital organs of respiration and heart, hence any damage to this part of the nervous system results in sudden death. In judicial hanging the drop of the body against the noose causes a fracture or dislocation of the first two cervical vertebrae which damages the bulb with immediate fatal result.

The Spinal Cord is a soft cord-like prolongation from the brain, situated in the spinal canal which runs along the back part of the spine. It is also made up of grey and white matter, but unlike the brain, the latter is on the surface completely enclosing the former. The grey matter consists of nerve cells and the white matter of fibres given off by the cells. The fibres from the brain cells, which pass to the opposite side of the cord, terminate in close contact with the nerve cells of the cord. These spinal cells send out similar fibres which form nerve trunks that pass out of the spinal canal on either side and are distributed to all parts of the body. The fibres coming from the brain do not directly communicate with muscles but convey the impulse to the spinal cells where it is relayed and transmitted to its destination through the spinal nerves. Similarly the sensation from different parts of the body is brought to the spinal nerve cells and relayed by them to the brain where it is actually felt.

The Nerves. These are soft cord-like structures which, coming out from the brain or the spinal cord, send fibres to all parts and organs of the body and through which all impulses, sensory or motor, are conveyed to and from the brain. Those which convey impulses to the muscles from the brain are called *motor nerves* and those conveying sensation to the brain are called *sensory nerves.* Any damage to a nerve is likely to interrupt the motor or sensory impulse along that nerve, causing paralysis or loss of sensation in the part concerned. Besides the motor and sensory nerves there is a third set of nerves controlling the nutrition ; these are known as *trophic nerves.* Damage to these interferes with the nutrition of the part controlled by them. Certain drugs, when injected into a nerve trunk or into the area of its distribution, temporarily abolish the conductivity of the nerve, so that no impulse can pass along its fibres and no sensation is felt in that area. Advantage is taken of this to produce what is known as local anaesthesia for performing certain operations without making the patient insensible.

THE DIGESTIVE SYSTEM

The digestive system consists of the alimentary canal and certain accessory organs that produce secretions for digesting the food. Digestion is the process by which the food is converted into soluble substances suitable for absorption and assimilation. The length of the alimentary canal is about thirty feet and it is divided into the mouth, pharynx, gullet, stomach, small intestine, large intestine, rectum and anus (Fig. 6). The accessory organs of digestion are the teeth for masticating the food, salivary glands, of which there are three pairs, liver, pancreas and spleen.

The Mouth. Food is masticated and mixed with saliva in the mouth before it goes to the stomach. The saliva contains a ferment called *ptyalin* which converts insoluble starch into soluble sugar for ready absorption into the system. This process of conversion of starch is not completed in the mouth, but continues for some time in the stomach. The masticated food passes into the cavity of the throat and down the gullet into the stomach. The cavity of the throat or the *pharynx* is the common passage through which the food from the mouth passes into the gullet, and the air passes to and from the nostrils and lungs during respiration. During the act of swallowing or deglutition, the upper end of the windpipe is shut off by a small oval cartilagenous projection on the back of the tongue called the *epiglottis.* Similarly, the passage to the nostrils is shut off by the soft palate ; in this way food is prevented from entering the air-passages.

The *gullet* or the *oesophagus* is a long muscular tube, about nine inches long; commencing at the lower part of the pharynx it passes behind the windpipe and opens into the stomach.

The *stomach* is the most distended part of the alimentary canal and is more or less conical in shape, situated in the upper and left side of the abdominal cavity. The exit from it is called the *pyloric opening*. It is about 12 inches long and four and a half inches wide at its broadest part, but the size varies in different persons and according to the amount of food in it. The presence of masticated food in it stimulates the small glands in its wall to pour out their secretion known as the *gastric juice*.

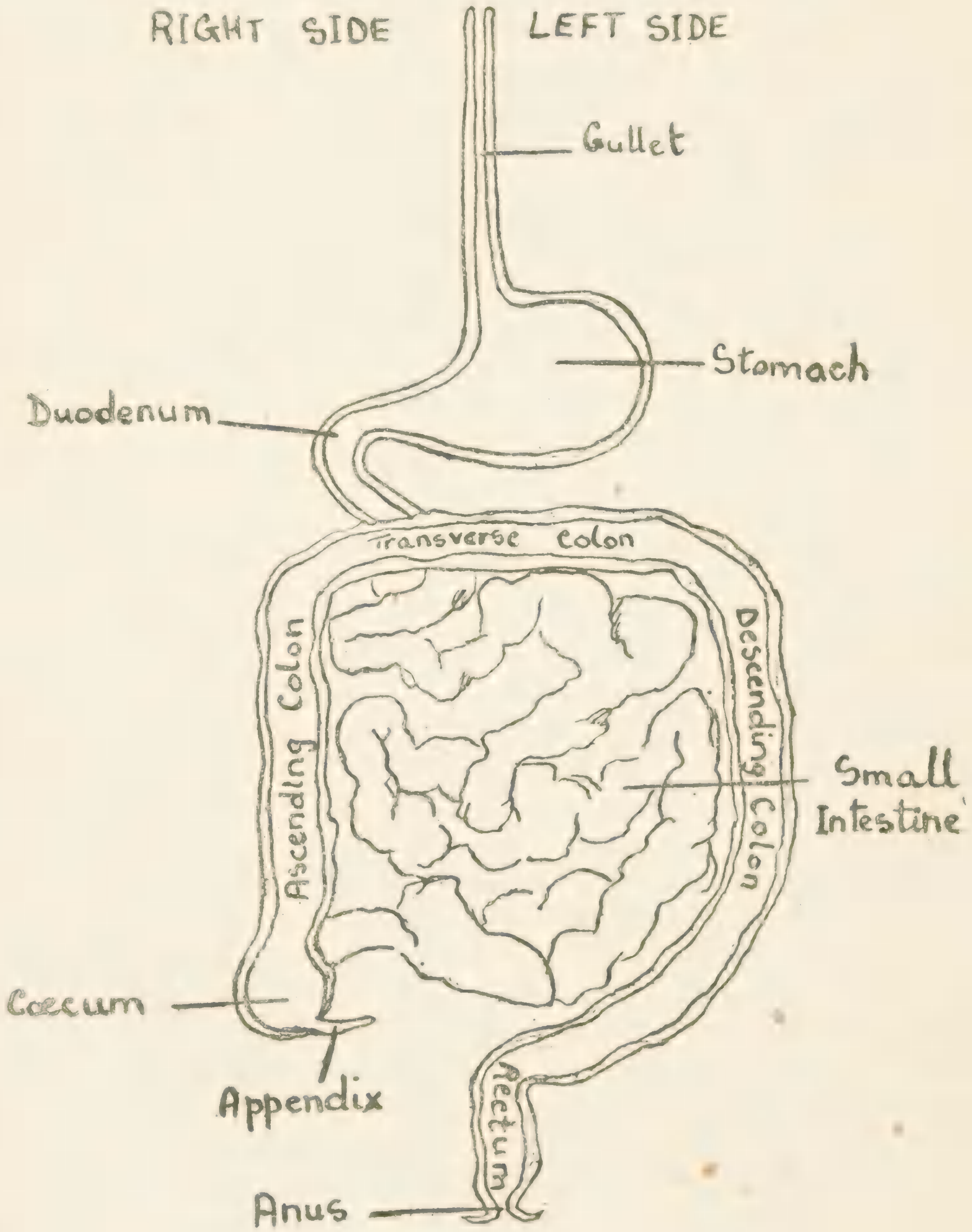


FIG. 6

. Diagram showing the arrangement of the elementary tract.

It is acid in reaction and contains from 0.45 to 0.5 per cent. of hydrochloric acid and two ferments, viz., *pepsin* and *renin*. The former converts insoluble protein into soluble peptone, and the latter curdles and digests milk. The process of digestion is not completed in the stomach, but the contents are reduced to a liquid condition called *chyme* and passed on to the small intestine where the digestion is completed. Very little absorption of food takes place in the stomach, but substances, such as soluble salts, sugar, alcohol, and some drugs are readily absorbed.

The next part of the alimentary canal is called the *small intestine* on account of the smaller size of its lumen. It is a convoluted tube about twenty feet long and is divided into three parts, the first of which, about ten inches long, is shaped like a horseshoe and is called the *duodenum;* the second part is called *jejunum,* and the last part is known as *ileum.*

The partly digested food, now in a liquid state, is further subjected to the digestive action of three secretions, viz., the *bile* from the liver, *pancreatic juice* from a gland called *pancreas* and the intestinal secretion from glands in the intestinal wall. The digestion of all the elements of food, viz., protein, starch and fat is completed in the small intestine, and the digested food, which is in a liquid state, is absorbed by fine capillaries and lymphatics of the intestinal wall. The sugar made from the starch is taken to the liver where it is stored and released as required for the use of the tissues. The product of protein digestion, peptone, passes through the liver before entering the general circulation. The absorption of fat takes place through intestinal lymphatics which convey it to the general circulation as we have seen before. Practically all the digested food is absorbed in the small intestine before the residue reaches the large intestine.

The small intestine opens into a large blind sack called *caecum,* which is situated in the right flank. From the lower and back part of this sack arises a small blind tube known as *appendix vermiformis* or appendix in short. Everyone is acquainted with its tendency to break out into sudden and often dangerous inflammation. Its length varies in different persons and is between two and six inches, its diameter being about that of a goose-quill. It is a redundant organ and has no particular function to perform.

The Colon or Large Intestine, so called from the larger size of its diameter, is divided into, (a) the *ascending colon* which rises from the caecum in the right flank and goes upwards as far as the margin of the ribs on that side where it forms a bend and continues to the left as (b) the *transverse colon* which lies transversely across the upper part of the abdomen and turning down forms (c) the *descending colon* which runs along the left flank as far as the pelvis, on entering which it forms a large loop known as (d) the *sigmoid flexure.* The last part of the alimentary canal, about six inches in length is known as the *rectum.* Commencing a little to the left of the middle line it terminates in the middle line of the perineum at the *anus,* which is surrounded by a muscular ring which keeps the opening closed and prevents the escape of the contents of the intestine. During the act of defecation the pressure from above forces the ring open to allow the contents to escape.

After the nourishment is absorbed in the small intestine the liquid contents are discharged into the colon where no further digestion takes place, but water is absorbed and the contents assume the characteristic colour, consistence and appearance of faeces.

THE ACCESSORY ORGANS OF DIGESTION

These are, the teeth for masticating the food so as to allow the digestive juices to act on it; the salivary glands which secrete saliva; the liver which secretes bile; the pancreas, which secretes pancreatic juice; the spleen and the small glands in the mucous membrane lining the intestine.

The Teeth. Human beings are provided with two sets of teeth, the first in childhood known as the *temporary* or *milk teeth,* which are twenty in number, and the second or the *permanent* set of thirty-two, sixteen in each jaw. The front four teeth in each jaw are called *incisors.* On each side of the incisor teeth is a pointed tooth, two in each jaw, called *canine.* The next two on each side are called *bicuspid* and the remaining three on each side are called *molars.*

The eruption of the temporary set commences at the sixth month and the first to appear are the lower central incisors followed by the corresponding upper ones, which begin to appear between the eighth and the tenth months. The next to make their appearance are the outer incisors and the first molars between the twelfth and twentieth months; the last to appear are the second molars between the twentieth and twenty-fourth months. In healthy well-nourished children they appear a little earlier, while in rickety ill-nourished ones the eruption is much delayed.

Normally the permanent teeth make their appearance in the following order, the lower ones appearing a little earlier than the upper.

First Molars—sixth year.
Two Middle Incisors—seventh year.
Two Lateral Incisors—eighth year.
First Bicuspid—ninth year.
Second Bicuspid—tenth year.
Canine—eleventh and twelfth year.
Second Molars—twelfth to thirteenth year.
Wisdom Teeth or the Last Molars—eighteenth to twenty-fifth year.

The Salivary Glands. There are three pairs of salivary glands which secrete saliva; the first pair (*parotid glands*) is situated just below the ears near the angle of the lower jaw. The secretion from these is carried to the mouth by a small duct, one on each side, which opens on the inner surface of the cheek opposite the second upper molar tooth. The second pair (the *submaxillary glands*) is situated under the lower jaw, and the third pair (*sublingual glands*) is placed under the tongue. The ducts carrying secretion from these two pairs open in the mouth under the tongue. The salivary secretion not only lubricates the food and facilitates its mastication and passage down the gullet, but it contains a ferment called *ptyalin,* which helps to digest starch; but its action is very limited.

The Liver. The liver is the largest gland in the body and is situated in the upper part of the right side of the abdominal cavity in close contact with the diaphragm and is well protected by the ribs in front and side. A small part of it, called the left lobe, extends beyond the middle line to the left. Liver secretes bile, which is conveyed to the first part of the small intestine, where it mixes with the chyme and helps to digest certain ingredients of food especially fats. The pigment of the bile gives the faeces its characteristic brownish yellow colour. In the absence of bile in the intestine the colour of the excreta is whitish as seen in jaundice, when the bile, instead of passing into the intestine, is absorbed into the blood on account of an obstruction to its flow.

The liver is also a great store-house of sugar or fuel. All of it which is absorbed from the intestine, is taken to the liver where it is converted into a substance called *glycogen* or muscle starch and stored in this form until required for use. When during physical exertion the muscles use up glycogen which is locally available, the liver liberates sufficient quantity so as to keep a constant proportion of sugar in the blood. During starvation this central store is gradually used up. The liver also keeps back harmful substances which might be absorbed from the intestine. Urea, which is one of the waste products of the body, is formed in the liver and certain changes in some of the constituents of the blood take place in it.

The Pancreas. This gland is situated in the upper and back part of the abdomen behind the stomach. Its secretion is carried to the first part of the small intestine by a duct, where it mixes with the contents and completes the digestion of proteins, starch and fat. This gland also produces another secretion which is not carried to the intestine through its duct, but is absorbed directly into the general circulation ; it is therefore called the *internal secretion* of the pancreas. This contains a substance known as *insulin.* The presence of insulin is necessary in the blood to bring about certain changes in the sugar so that it becomes fit to be stored in the liver and muscles for use whenever required. When insulin is absent, as in patients suffering from diabetes, sugar cannot be stored nor properly used in the tissues, so that an excessive amount of it accumulates in the blood and is passed out in the urine by the kidneys. Normally the amount of sugar present in the blood varies between 0.1 and 0.15 per cent and remains at a constant level, except for a short time after a meal rich in starch or sugar, when it may reach 0.18 per cent ; but any quantity above this is promptly excreted in the urine.

The Spleen. The spleen is situated in the upper and left part of the abdomen and when it is normal in size it is not felt below the margin of the ribs. In malaria and certain other diseases, it becomes enlarged, may project beyond the ribs and is easily felt with the fingers. Normally it is soft, but when diseased and enlarged it becomes hard and friable and is readily ruptured. As it has large blood-vessels its rupture is very dangerous and may be rapidly fatal. It is indirectly concerned with digestion of food, its main function being in connection with the formation of blood.

The Peritoneum. The peritoneum is a thin, soft glistening membrane which lines the inner surface of the abdominal wall and covers almost all the organs in the abdomen. It does not take any part in the process of digestion and its function is to protect the organs, prevent friction between them and hold them in their places. Any infection of this membrane, either from the bowels or from outside, is very dangerous and likely to prove fatal.

THE RESPIRATORY SYSTEM

The respiratory system consists of the lungs and the air passages, viz., the nostrils, the nasal cavity, the pharynx, the larynx, the trachea or the windpipe, the right and left bronchus which are the two divisions of the windpipe, and the subdivisions of the two bronchi.

The *nasal cavity* is divided into two by a partition made up partly of bone and partly of cartilage ; this partition forms the inner wall of the two cavities. From the outer walls of each cavity project three irregular pieces of bone into the cavities. There are some hollow spaces in the bones of the face, which communicate through narrow openings with the nasal cavities. These cells are liable to be infected with septic microbes from the nasal cavities when these are infected. The cavities open behind into the pharynx or the cavity of the throat.

The Larynx. The larynx is the organ by which articulate sounds are produced. It is placed below the pharynx and at the top of the windpipe behind the tongue. It is made up of several pieces of cartilage, muscles, ligaments, and two *vocal cords.* The projection in front of the neck known as the *Adam's Apple* is caused by the larynx.

The Trachea or windpipe is a long fibrous tube lined with mucous membrane containing several cartilagenous rings which keep its lumen patent. It extends from the larynx to the root of the lungs where it divides into two bronchi, the right and the left. Each *bronchus* enters the corresponding lung and divides and subdivides until the terminal minute branches open into the air cells in the lungs where the atmospheric air is conveyed and where exchange of gases takes place.

The Lungs. The lungs are the essential organs of respiration and are two in number, one on each side of the thoracic cavity, the left being slightly smaller on account of the space taken up by the heart on that side. Each lung is divided into two parts called lobes, by a deep fissure. Like the abdominal organs the lungs are covered by a thin membrane called the *pleura,* which lines the inside of the chest wall also. The lungs are composed of minute hollow cells or cavities with very thin elastic walls ; into these cells open the smallest terminal branches of the bronchi which bring the atmospheric air into them. The walls of the cells are surrounded by a fine network of capillaries through whose walls the carbon dioxide gas present in the blood is discharged and the oxygen from the air absorbed into the blood. The lungs, though elastic and expansible, do not possess the power to expand, their expansion being brought about by the expansion of the air-tight thoracic cavity by muscular action. The elastic lung tissue moves with the chest wall and the atmospheric pressure forces the air into the lungs through the only opening, the larynx. The diaphragm or the muscular partition between the chest and the abdominal cavity, by its contraction during inhalation, flattens out its dome and thus helps to enlarge the thoracic cavity still further.

THE URINARY SYSTEM

The urinary system consists of two kidneys, the right and the left, the ureters which are thin long tubes carrying the secretion of urine from the kidneys to the bladder, the urinary bladder which collects the urine until it is voided, and the urethra.

The Kidneys. The kidneys are situated in the back part of the abdomen, one on each side of the spine, behind all the organs and the peritoneal lining of the abdominal wall. In this position they are well protected against injury ; however, a direct blow on the small of the back or a fall on a projection is liable to damage them. The kidneys perform one of the most important functions in the body, viz., the removal of the waste products of the tissue activity from the blood in the form of urea, uric acid, etc., which, if allowed to accumulate, would cause fatal poisoning. The excretory cells of the kidney pick out from the blood all such substances and any poison that may be circulating. When the kidney tissue is put out of action through disease or injury the waste products accumulate in the blood and produce certain symptoms called *uraemia* which ends in death, unless the function of the kidneys is re-established. When one kidney is put out of action the other becomes enlarged and does the work of both.

The Ureters. These are two long narrow tubes, one from each kidney, which carry away the urine from the kidneys to the bladder. Each is about sixteen inches long and of the same diameter as that of a goose-quill. The lower end of the ureter is guarded by a valve which prevents the flow of urine towards the kidney when the bladder is full.

The Urinary Bladder. The urinary bladder is an elastic muscular pouch, in which the urine accumulates until its distension causes a feeling of discomfort and a desire to void it. It is situated in front of the pelvic cavity, just behind the pubic bone, and when fully distended it projects above the level of this bone and can be felt with the flat of the fingers. Its wall contains muscular fibres, which by their contraction expel the urine. A strong circular muscular ring around the exit from the bladder prevents the escape of urine from the bladder. This ring is called the *sphincter*, which is stretched and opened when the bladder contracts on its contents.

The Urethra. It is the passage through which the urine from the bladder is excreted. Its length in the male is much greater than in the female. Chronic gonorrhoea, specially in the male, or an injury to it is likely to be followed by a stricture which may completely obstruct the flow of urine and may require dilatation with instruments or an operation.

THE REPRODUCTIVE SYSTEM

The reproductive system in the male consists of the *testes*, *spermatic cords*, *seminal vesicles*, *ejaculatory ducts* and *prostate gland*. The testes are enclosed in the scrotum and suspended by the spermatic cords. Each cord contains the excretory duct from the testis (*vas deferens*), blood-vessels, nerves, and muscular fibres. They are formed in the abdomen during the uterine life and descend into the scrotum when the foetus is fully developed. Sometimes one or both fail to descend and may remain in the abdomen or come down only as far as the groin where they can be felt. If after birth they do not show any tendency to come down, it may be necessary to bring them down by an operation. Preparations of male hormone injected subcutaneously very often help to bring them down without any operation. They secrete the *seminal fluid* containing *spermatozoa* or sperm cells which are microscopic living bodies with a large round body and a thin long filament or tail. They are very motile and move about very actively in the fresh specimen of the spermatic fluid. When deposited in the female genital passage they rapidly travel as far as the womb and through the Fallopian tube to the ovary. One of these unites with the ovum or the germ cell discharged from the ovary, which then attaches itself to the mucous membrane of the womb and begins to grow to form the embryo.

In addition to the seminal fluid, the testes secret an internal secretion containing the male sex-hormone or a substance necessary for the development of secondary male characters, viz., hair on the face, male voice, muscular strength and vigour. This secretion is not conveyed through the excretory ducts but is directly absorbed into the circulation. Removal of both the testes or their complete destruction through disease or injury deprives the body of the power of reproduction, and if this takes place before puberty the body is not fully developed, the hair on the face is absent and the voice is high pitched.

The Prostate Gland. This is a small round gland situated round the neck of the bladder through which the first part of the urethra passes. It secretes the prostatic fluid which mixes with the seminal fluid. It is absent in the female in whom it is represented by the womb. It has a tendency to increase in size after the age of 55 and may obstruct the flow of urine in the urethra and unless removed in time by an operation may be the source of serious trouble.

The Seminal Vesicles. These are two lobulated pouches, one on each side near the neck of the urinary bladder in which the seminal fluid, brought by the excretory ducts from the testes, is stored. Two small ducts (ejaculatory ducts) pass out from these and running through the prostate gland open in the urethra through which the seminal fluid is discharged.

For the anatomy of the female reproductive system see part II.

DUCTLESS GLANDS

Ductless glands are those which do not have an excretory duct to take away their secretion which gets directly absorbed into the blood. The glands are known as endocrine glands and their secretion as endocrine secretion. The secretion regulates the functions of different organs, controls the metabolism and is responsible for the maintenance of health, strength and vigour of the body and the development of mental faculties. These glands are the *pituitary* and *pineal* in the skull, *thyroid* and *parathyroids* in the neck, *thymus* in the chest and *spleen*, and two *supra-renals* in the abdomen. Some glands possessing excretory ducts, such as the pancreas, testes in the male, and ovaries in the female, produce internal secretion also which is absrobed directly into the circulation.

The pituitary and the pineal are chiefly concerned with the growth of the skeletal bones ; an excess of their secretion causes their abnormal growth. The pituitary also controls the sexual activities in both the sexes and regulates the excretion of urine. The thyroid is mainly responsible for regulating the metabolism of carbohydrates and fat. The absence of its secretion, due to disease or removal, causes in grown up persons a condition known as *myxoedema* in which the skin becomes thick, swollen, dry and rough, pulse is slow, the hair falls out, movements are slow and sluggish, there is loss of memory and mental dullness. Prolonged administration of the extract prepared from the thyroid of animals removes these symptoms. Its congenital absence produces a condition called *cretinism* which begins to appear at the age of six months. The child is weak, under-developed and under-sized, teething is late and the different stages of its development are very retarded ; it takes much longer to be able to walk or sit or utter articulate sounds. The symptoms may be mitigated considerably by the administration of the gland or its extract, but the benefit is not so marked as in myxoedema. An excessive secretion of the gland produces a toxaemic condition known as Graves' disease or exophthalmic goiter, in which there is increased metabolic activity marked by rapid pulse, palpitation, dilatation of the heart, and loss of weight. In advanced cases the eyeballs protrude and the gland becomes enlarged.

The thymus gland functions in children and is concerned with the nutrition of the body. After puberty it atrophies and disappears.

Parathyroid are four small glands situated in the neck behind the thyroid. They are responsible for the metabolism and absorption of calcium salts and phosphorus. The absence of their secretion produces tetany in which the muscles are in a constant state of spasms and tremors.

Suprarenal glands or adrenal bodies are two small glands situated in the abdomen, one on each side, in close contact with the kidneys. Their function is to control the tone of all the involuntary muscular fibres of the stomach, intestines, blood-vessels, etc. The removal of these glands is followed by death within a few days. A rare disease, known as Addison's disease from the physician who first described it, is produced by the deficiency of the secretion of these glands. There is progressive aneamia, low blood pressure, physical and mental prostration, dark patches on the skin of the face, hands and trunk, also on mucous membranes. Prolonged injection of the extract obtained from the gland of animals improves the condition for a time, but the condition is incurable and ultimately ends in death.

The internal secretion of the testes produces male characteristics, viz., the growth of hair on the face, muscular vigour and strength, etc., and that of the ovary produces secondary female characteristics, especially the development of the breasts and the menstrual cycle.

For the internal secretion of the pancreas see under "Diabetes."

ELEMENTARY BACTERIOLOGY

Bacteriology is the science which deals with the study of minute microscopic living organisms, which are called microbes or bacteria. These are very minute in size and are invisible to the unaided eye. They are the lowest form of animal or vegetable life and as seen through the microscope consist of one single cell which varies in size and shape. They multiply very rapidly under favourable conditions, and are universally distributed in nature, being present in air, water, soil, etc. All the micro-organisms found in nature are not pathogenic or disease-producing. Many of them are harmless to the human body and serve a very useful purpose in the economy of nature by breaking up decaying organic matter into simpler harmless substances, while others are responsible for producing dangerous or fatal diseases when they gain admission into the body, e.g., tetanus, plague, diphtheria, pneumonia, etc. Some of these pathogenic microbes are found in nature leading an independent existence and produce the disease when they find their way into the body, such as tetanus, gas gangrene, etc., while others that are responsible for plague, pneumonia, diphtheria, etc., are not found outside the human or animal body, except when they are artificially cultivated in the laboratory. They have received different designations according to their shape and arrangement ; those that have small round bodies are called cocci ; these may be arranged in a cluster or in long rows of single cells, the former being called staphyloccoci and the latter, streptococci. Those that have elongated bodies like rods are known as bacilli; these are also arranged in a cluster or end to end like a chain.

The pathogenic organisms, when they get an entrance into the body, find very favourable conditions for their existence and multiply very rapidly. A very minute quantity of these—that which can be carried on the point of a pin—is enough to start the disease if injected into the body. The waste product of the chemical and other changes that take place during the process of their growth and multiplication, is discharged into the circulation and is carried to all parts of the body by the blood stream and produces the unpleasant and dangerous symptoms of the disease.

The mode of entrance of these micro-organisms into the body varies with different bacteria and may be, (a) through inhalation of the infected air, as in the case of tuberculosis, diphtheria, influenza, etc. The sputum of patients suffering from tuberculosis contains myriads of living germs and their spores ; as also the fine spray produced while coughing. This fine spray keeps floating in the atmosphere of a close, ill-ventilated room for a long time. The sputum when indiscriminately thrown about, is another very fruitful method of spreading the disease, as minute particles from the dried up and pulverised sputum are carried into the atmosphere with the dust and when inhaled by persons who are susceptible, or who are in a low state of health, produce the disease. (b) The next common mode by which the bacteria gain entrance into the body is through the alimentary canal, with food or drink ; cholera, typhoid fever, diarrhoea, dysentery, etc., are typical examples of this. In these diseases the excreta and the vomited matter contain the infection in a virulent form. It is therefore very necessary to handle these with care before they are disinfected and disposed off. Inexperienced and careless nurses and ignorant attendants are not only very liable to catch the disease, but are likely to spread it to others. Flies are particularly dangerous, as they carry the infection from the excreta to food. (c) Direct contact with infected matter, as in the case of gonorrhoeal disease where the discharge from a patient comes in direct contact with the mucous membrane of a healthy person. (d) Direct contact with a wound is another common method by which the microbes enter the body. The healthy skin affords an efficient protection against the entry of bacteria, but when there is a breach of surface or even a small microscopic scratch it becomes possible for them to enter the body. Considering the universal prevalence of micro-organisms every wound, unless it is the result of a surgical operation performed under proper aseptic conditions, is necessarily infected with one or more of these microbes. Some of the less virulent ones are easily got rid of by the resisting powers of the body. A clean cut wound inflicted with a sharp knife is less liable to infection than one inflicted with a rough blunt instrument which causes laceration and damage to the tissues lowering their vitality and thus creating favourable conditions for the microbes to grow. (e) Auto-infection or infection by self. In the air passages of almost every individual there are microbes of many diseases, such as pneumonia, influenza, etc., which under ordinary conditions of health remain harmless, but when the person's vitality is lowered from any cause, like a severe chill, exhaustion from excessive physical exertion or mental stress, they become virulent and produce the disease. The presence of pus in pyorrhoea of the gums is also liable to cause a good deal of trouble in other parts of the body which is likely to become more serious than the original condition. (f) Accidental inoculation of the microbes under the skin with an unsterilised or improperly sterilised hypodermic syringe. This is very often the case when the patient himself uses the syringe, as in the case of a drug addict or a diabetic patient who habitually takes insulin by hypodermic injection. Tetanus, septicaemia, abscess, etc., might result from such an accident. A case is on record where a medical man was tried for injecting plague bacilli with a hypodermic syringe for homicidal purposes into a person causing the death of the victim. (g) Lastly, through insect bites; plague, typhus, yellow fever, relapsing fever, malaria and oriental sore are some of the diseases thus transmitted.

Ordinarily a healthy human body, with all the organs functioning normally, has great protective or disease-resisting powers and unless the bacteria are very virulent or are introduced in a very large quantity, the protective mechanism of the body can get rid of them. This protective mechanism is much weakened by any condition that lowers the vitality of the body, such as, any chronic disease like malaria, chronic alcoholism, dissolute life, insufficient nourishment, want of fresh air and regular physical exercise, physical exhaustion or mental strain.

CARRIERS. It has been observed that there are many healthy persons who harbour in their bodies the microbes of certain diseases, like cholera, typhoid fever, diphtheria, cerebro-spinal fever and others, without themselves suffering from the disease. They not only carry the microbes of these diseases but unconsciously act as their distributors and in consequence are a source of danger to public health. The microbes may persist in the body of the carrier for years or for life. Most of these carriers have suffered from the disease and have recovered from it, but there are some carriers who have not had the disease at any time, yet they carry the infection and are capable of transmitting it to others. A person who is not a carrier but who has caught the infection may convey it to others during the *incubation period,* which is the time between the infection and the first appearance of the disease. Such a person is known as an incubatory carrier, as he carries the infection during the incubation period of the disease. Carriers who have to handle food, such as, cooks, waiters, dairymen, and sweetmeat sellers, are particularly dangerous to the health of others. There is a case on record of a female cook who was a typhoid carrier and who had served for a number of years in different families, during the course of which she had conveyed the disease to several members in each of these, and in all twenty-eight cases of typhoid were definitely traced to her. Some years ago a sudden and wide-spread epidemic of cholera broke out in a large city in India which possessed an excellent water-supply where water was filtered and purified before distribution. A searching inquiry was instituted in the course of which it was found that one of the servants enployed in cleaning the service reservoir was a cholera carrier who had previously suffered from the disease and had recovered from it. The outbreak of cholera and other water-borne diseases at pilgrim centres in India is due to contamination of water-supply by carriers.

IMMUNITY. An attack of an infectious disease, or a mild attack of it artificially produced by the injection of an attenuated living virus or dead bacteria, affords immunity against the disease which may last for months or for life.

CHAPTER 2

PULSE, RESPIRATION, TEMPERATURE, ETC.

Before beginning the study of various diseases it is necessary to be acquainted with the normal and abnormal conditions of the pulse, respiration, temperature, tongue, conjunctiva, and skin, so as to be able to detect any changes in them and appreciate their significance.

PULSE. The taking of pulse is one of the oldest methods of clinical investigation. It gives much useful information about the condition of the heart, the severity of the disease, etc. It is the sudden impulse felt over an artery when it is pressed with the finger against a bony background. It is caused by the sudden expansion of the elastic arterial wall when a quantity of blood is pumped by the heart into the aorta. It can be felt in any artery in the body that is accessible, but the radial artery in front of the wrist near the root of the thumb is very convenient, being superficial at this point and compressible against the lower end of the radius. The things to note while feeling the pulse are : its frequency, i.e., so many beats per minute ; its rhythm, i.e., whether all beats are spaced at regular intervals ; its force and volume, i.e., the range of expansion of the arterial wall and the pressure required to stop the flow. The condition of the arterial wall, viz., its hardness or elasticity can also be determined.

The frequency at rest varies to some extent in health according to age. From birth till the end of the first year it is between 130 and 140 ; after that it begins to get less and is about 90 at the end of the sixth year ; between 14 and 20 it ranges between 80 and 85 and in the adult between 70 and 78 a minute. In old age it rises a little but is under 90. It also varies in health, rising during exercise and subsiding to normal within a short time ; it also rises after meals and during excitement. In some healthy individuals it is habitually higher or lower than normal. The patient should be at rest for at least three minutes before the pulse is counted. The wrist is held about an inch above the root of the thumb, the first two fingers resting on the artery and the thumb on the back of the wrist. For accuracy the beats should be counted for one full minute.

Abnormal frequency of the pulse is due to : (1) Fever, when the increased rate is in proportion to the temperature, but sometimes it is disproportionately high or low, the former in scarlet fever, septicaemia, etc., and the latter in yellow fever, meningitis, etc. (2) Anaemia. (3) Heart disease. (4) Irritable heart with the least exciting cause. (5) Debility. (6) Toxic goiter which is a disease of the thyroid gland. (7) Certain drugs, such as alcohol, tobacco, etc. (8) Chronic wasting diseases. (9) Lastly, a peculiar condition known as paroxysmal palpitation in which the pulse rate suddenly shoots up to 180 or even 200 a minute returning to normal quite as suddenly.

In ordinary illness the pulse is taken morning and evening and recorded on the temperature chart ; but in serious cases and in fever it is necessary to record it every four hours. Increasing pulse rate is usually an indication of increasing severity of the illness and a frequency of 140 or over in an adult patient shows a serious condition. A running pulse, i.e., one which is so rapid that it can not be counted is a sign of exhaustion of the heart and of approaching end.

Rhythm of the pulse is normally regular, i.e., the interval between beats is constant. The pulse is also regular in volume, i.e., the expansion of the arterial wall is uniform for every beat. In disease the rhythm is liable to be disturbed and the pulse may be irregular in time or volume or both. The irregularity in time is due to the heart occasionally missing a beat at regular or irregular intervals. The irregularity in volume is due to a feebler contraction producing a smaller wave. The disturbed rhythm in a functional disturbance of the heart is of no serious import but is a serious symptom in an organic disease of the organ.

The pressure of the blood in the arteries varies during the contraction and dilatation of the heart, being at its maximum when the heart contracts and at its minimum during its dilatation. The pressure can be roughly estimated by the force required to obliterate the pulse by the fingers. The exact pressure is estimated by an instrument called sphygmomanometer, which has a pneumatic band to be tied round the arm, and communicating through a rubber tube with a vertical glass tube containing a column of mercury. Air is pumped into the pneumatic band round the arm until the pressure in it is sufficiently raised to obliterate the pulse at the wrist. The air pressure causes the column of mercury in the tube to rise and the height to which the column reaches when the pulse stops is noted. A better method is to listen to the heart sounds with a stethoscope on the artery at the bend of the elbow and note the height of the column when the sound becomes inaudible. This gives the maximum or systolic pressure, i.e., when the heart contracts. The compressed air is then allowed to escape slowly through a valve when the sound becomes audible again and when the column of mercury comes down to a certain level the character of the sound is suddenly altered and then it stops ; this lower height indicates the diastolic pressure, i.e., when the heart dilates. A constant high blood pressure due to thickened arteries is liable to cause apoplexy from rupture of small vessels in the brain and produce paralysis of the muscles controlled by that area of the brain.

The condition of the arterial wall, viz., its hardness or elasticity, is determined by rolling the artery under the fingers, the pulse or the tortuous artery visible on the temple is convenient for the purpose. Thickened arteries feel like hard cords. In old age the arteries tend to be hardened and less elastic, while in diseases of the kidneys, habitual alcoholism, syphilis and chronic metalic poisoning, they become brittle earlier. In many individuals and families the hardening sets in much earlier which adversely affects their prospects of longevity, while in others the thickening is much delayed.

RESPIRATION. Respiration is the act of drawing the atmospheric air into the lungs and exhaling it after the exchange of gases has taken place. Its frequency or rate per minute in a healthy individual is between 16 and 18 ; in women it is slightly higher. In children under 5 it is between 30 and 35, from 6 to 10 years it is 22, and after 16 it comes down to between 16 and 18. During sleep it is less than in the waking state. In health rapid breathing is due to exercise or mental excitement. The ratio between the respiration and pulse rate is constant being 1 to 4 or 4.5 and even in disease this ratio is maintained. The frequency of respiration is increased in diseases of the respiratory organs and heart, in fever, and poisoning with certain drugs, while it is reduced in apoplexy, tumour of the brain, coma, and poisoning with narcotics. The frequency is determined by placing the hand on the chest and counting the movements.

In normal breathing the movement of the chest is equal on both sides and there is no drawing in of the spaces between the ribs. When one lung or a part of it is diseased the movement on that side is limited or absent. Normal breathing is not audible to unaided ears, but with the help of a stethoscope a low sound is heard with each inspiration and expiration which is known as the respiratory murmur. In disease the character of the murmur is altered and abnormal sounds may be present from which the condition of the lungs can be determined. The characteristic wheezy sound during an attack of asthma as also the noise of difficult breathing due to an obstruction of the air passage can be heard from a distance.

BODY TEMPERATURE. All animals are divided into two classes, viz., warm and cold-blooded. In the latter the body temperature is not constant but varies with that of their surroundings, while in the former it remains constant within certain narrow limits. Fishes, reptiles and amphibia are cold-blooded and birds and animals are warm-blooded.

The normal temperature of the human body is 98.6°F which varies to the extent of 0.5 degree in either direction in health. It is lowest in the morning and rises during the day reaching the highest point in the afternoon. The heat is generated by the muscle, liver, kidneys, and to a certain extent by the chemical action of digestion. The temperature is taken with a clinical thermometer placed in the armpit, mouth or rectum, and in children in the groin. In the rectum it is 0.5 to 1 degree higher than in the armpit. In the mouth it is not reliable unless taken with proper precautions. If the patient breathes through the mouth the evaporation lowers the local temperature, and it is raised for the time being if a hot fluid is taken. The thermometer is kept between the tongue and the floor of the mouth without keeping any hollow space between the two and it should be kept a little longer than the time given on it. When the armpit is used it should be wiped dry and the whole bulb held in such a way that the skin on both the sides touches it. The most reliable way of getting the temperature is to insert the bulb into the rectum as it gives the temperature of the interior of the body. The mouth and the rectum are not suitable in children, delirious and insane persons.

The body temperature is kept at a constant level by the heart regulating mechanism in the body. The loss of heat takes place by radiation from the surface and by the cooling effect of evaporation of moisture from the skin and lungs. When the temperature of the surrounding atmosphere rises the capillaries in the skin dilate and expose a larger volume of blood on the surface of the body. At the same time the sweat glands become active and keep the skin moist and cool. In cold weather the reverse change takes place and the blood vessels of the skin contract and the sweat glands remain inactive while the production of heat in the body increases. It is for this reason that more fuel, i.e., food, is required in cold weather. This mechanism is not fully developed in children and the least disturbance in the body causes a rise of temperature.

For measuring the temperature a clinical thermometer with a magnifying front is very convenient. Some of the cheap ones are not reliable. In illness the temperature should be taken every four hours, commencing from 8 a.m., and a written record kept from the very beginning as it is of great help in diagnosing and prognosticating the course of illness. The characteristic diurnal rise and fall in many diseases can be seen at a glance on the chart as also the rate of pulse and respiration. A temperature below 98°F is called subnormal ; if it is below 96°F it is a sign of collapse and if it continues so low for some time it is likely to end in death. A temperature of 106°F and over is known as hyperpyrexia, which is dangerous to life if it remains so high for long.

TONGUE. The tongue is the window through which many abnormal conditions of the body can be seen, as its appearance, colour, consistence, etc., vary in different conditions of health and disease. It is a muscular organ covered with pink red mucous membrane and is coated with a thin layer of greyish fur which is usually not noticeable. In habitual constipation the fur is much thicker and of a dark brown colour and of an offensive odour ; in chronic stomach and bowel troubles it is large flabby and shows indentations caused by the teeth ; in anaemia it is pale and flabby ; in typhoid fever the centre is covered with thick brown fur and in the later stages of the disease the tongue becomes raw and beefy in appearance, in scarlet fever it is covered with small red papillae which give it a strawberry appearance. In inflammation of the tongue it becomes red, swollen and very sensitive to hot or cold fluids and condiments. In a disease of the tongue called leukoplakia there are greyish white patches on its surface. Cancer of the tongue commences at the tip or on the margin as a hard nodule or a painful ulcer with raised margins. In paralysis of one side of the body when the tongue is also involved it is drawn towards the healthy side when projected. In extreme debility, chronic alcoholism, or chronic metalic poisoning it is tremulous.

CONJUNCTIVA. The healthy conjunctiva is moist and pinkish red in colour. In anaemia it is pale or may be quite white. It is yellow in jaundice. Yellow coloration is also produced by some drugs, such as atebrin, etc. Mangoes, eaten is excess, impart a yellow colour to the skin and conjunctiva. In many infectious diseases it is blood-shot or has small patches of bleeding underneath it. In some vitamin deficiency diseases it is dry, lustreless and sometimes encroaches on the cornea.

SKIN. The colour of the skin differs in different races and in different individuals of the same race. In dark persons any change in the normal colour is not at all easy to make out. However, some idea can be had by observing the palm of the hand and the nails. In anaemia it is of a pale earthy colour ; in jaundice it is yellow ; in a disease of the adrenal glands it becomes dark ; in septicaemia, plague, and typhus it becomes black towards the end ; in deficient oxygenation of the blood it is livid, and in some diseases of the blood, scurvy, and many acute infectious diseases, there are patches of subcutaneous bleeding varying in size from minute points to large areas. In young healthy persons it is elastic and tightly stretched, while in old age and emaciation it is loose and wrinkled.

CHAPTER 3

SOME SYMPTOMS AND COMMON AILMENTS

APPETITE. Impairment or loss of appetite is caused by a heavy indigestible meal, over-exertion, want of exercise, constipation, excessive indulgence in alcohol, starvation, or emotional strain. It may be periodic, recurring at intervals and unless properly treated it tends to become chronic, in which case there may be a complete absence of the gastric juice (*achylia*) with a sense of heaviness or discomfort in the stomach after meals. The treatment is to remove the cause. In an acute attack the stomach requires complete rest for 12 to 24 hours during which no solid food should be taken. A saline purgative is useful in getting rid of any indigestible substance that might be present. In persistent cases all physical, mental or emotional strain should be avoided. A change to a bracing climate with a complete change of scene is beneficial. Moderate outdoor exercise, regular habits, light and wholesome food, and abstinence from alcoholic excesses are sufficient to restore the normal digestive function of the stomach, unless an organic disease is present. In old cases the administration of a bitter stomachic tonic (No. 52), pepsin or papain and taka-diastase with or soon after food is useful. These are available in powder or tablet form. If the above measures do not succeed there is a possibility of an organic disease of the stomach requiring investigation and professional help.

No solid food should be taken after a prolonged fast which should be broken with a small quantity of barley water, fruit juice, or diluted milk sweetened with glucose. Later on this is supplemented with a small quantity of semi-solid food, and the normal diet restored gradually.

ABNORMAL APPETITE. False loss of appetite or *pseudo-anorexia* is met with in hysterical or neurotic persons who apparently eat nothing and abstrain from food at meal times and in the presence of others, but really consume a large quantity of food in secret. Some *yogis* in India have acquired the power of suspending animation or vital functions of the body at will, and can go without food and water for days. Inordinate appetite, *hyperorexia* or *bulimia* means an increased sensation of hunger, which is associated with some diseases. There are some healthy persons with habitually excessive appetite, who eat a large quantity of food, but apart from this the condition is associated with diabetes, hysteria, gastric ulcer, excessive activity of the thyroid gland, and certain types of insanity. Sometimes there is an increased sensation of hunger yet the patient is unable to take much food or derive any satisfaction from eating. In another abnormal condition, known as *parorexia*, there is a craving for special or some abnormal article. It is found in pregnancy, hysteria, or in persons suffering from worms. In some children and hystericals or insane persons there is a perversion of appetite called *pica* in which there is a craving for inedible substances, such as pins, nails, pebbles, hair, earth, etc., which cause intestinal obstruction or ulceration with serious results. *Aerophagia* is a habit, common in hysterical persons, of swallowing air which causes distension of the stomach and frequent eructations of gas. *Coprophagia* is a disgusting form of perverted appetite in which the person, usually insane, is addicted to eating human or animal excreta.

ACIDITY OF THE STOMACH. An excessive secretion of hydrochloric acid is found in mental or emotional strain, frequent indiscretion in diet or drinks, irregular hours, some diseases of the stomach, such as ulcer, or some other condition unconnected with that organ, such as chronic appendicitis, kidney or liver trouble, or intestinal worms. As a rule the appetite is not affected and the patient is able to enjoy his food, but from half to two hours after a meal there is what is known as heartburn or sour stomach with a sense of distension and frequent eructations of a small quantity of very acid food, palpitation and discomfort about the chest. The trouble may disappear for a time and recur after an interval. The treatment is to find and remove the cause. An antacid powder (No. 133) or an alkaline mixture (No. 52) taken one hour after meals will relieve the discomfort by neutralizing the excess of acid. Gastric ulcer, chronic appendicitis or disease of the kidneys or other organs that might be present requires suitable treatment.

BEDSORES. A bedsore is an ulcer which occurs in patients who are confined to bed for a prolonged period and is commonly met with in persons suffering from paralysis due to spinal injury, typhoid fever, or other prolonged illness. The part of the body subjected to constant pressure against the bed becomes denuded of blood and ulcerates. In mild cases and when the condition of the patient is not bad it is not serious and readily heals with proper treatment, but in a debilitated subject unable to change his position in bed, it extends into the muscles and bones, becomes septic and kills him. In every case of severe illness when the patient is likely to remain in bed for a long period, strict precautions are necessary against its formation. These consist in providing a soft and comfortable mattress, a spongy rubber one is good, as it can be easily cleaned and kept dry, but in hot climates it is very uncomfortable ; an air or water cushion, not too tightly inflated is equally good. Keeping all bed clothes clean and dry and spreading them evenly without any creases or folds, daily washing the patient's back and all parts touching the bed with some plain soap and warm water and drying them with a soft towel, rubbing these parts with rectified spirit or brandy and dusting them with zinc boric powder (No. 138), frequently changing the patient's position in bed so as to prevent prolonged pressure on any one part, and keeping a constant watch to detect early signs of the trouble, such as redness of the skin or the formation of small blisters, are the measures necessary to counteract them. The affected area should be surrounded by a ring cushion of rubber, not too tightly distended. If a pneumatic rubber ring is not available, a sufficiently thick ring of soft cotton wool might be used. If a sore has already formed it should be cleaned twice daily with some mild antiseptic lotion and dressed as an ordinary ulcer, and the area protected from pressure. If septic infection has taken place the use of powdered sulpha drugs or penicillin ointment is beneficial.

COLIC. Colic is a sudden attack of severe spasmodic pain in the abdomen, originating in different organs from various causes. It is called intestinal, appendicular, biliary, or renal, according to the organ in which it originates.

Intestinal colic is caused by a strong purgative, the presence of an irritating substance in the bowel, or over-distension of its wall due to an obstruction to the free flow of its contents. The obstruction may be from a mechanical constriction, the presence of hard faecal or other matter in the bowel, or a tumour. An obstinate variety of intestinal colic is found in chronic lead poisoning common among painters, plumbers, compositors and those who habitually handle this metal or its salts. The pain is usually severe, comes on suddenly, may be accompanied with or followed by vomiting, and is diffused all over the abdomen or is felt about the navel. It is not accompanied by fever and is relieved to a certain extent by pressure. Constipation may be present but there is diarrhoea if it is due to an irritant substance.

The treatment depends upon the cause. The loaded bowel should be relieved by means of soap-water enema to which a teaspoonful of turpentine has been added. It is repeated if the result is not satisfactory. If there is no suspicion of appendicitis or an inflammatory condition or an obstruction of the bowel a purgative might be given. For this purpose a moderate dose of castor oil or of sulphate of magnesium in water is the best. The presence of fever is an indication of an inflammatory condition, but it may not always be present. If after unloading the bowel the pain persists, 10 minims of tincture of opium (laudanum) with the same quantity of tincture of belladonna might be given by the mouth.

In India there are some massage "experts" who specialize in abdominal massage and diagnose every case of pain in the abdomen as a displacement of some imaginary gland from its place (in Gujerat they call this gland *pechuti*). They restore this gland to its place by vigorous massage, which is so violent and painful that the patient is likely to forget his trouble. Needless to say if the case is one of appendicitis or other inflammatory condition the "expert" treatment would end in a disaster.

Appendicular colic originates in the appendix on account of spasmodic contractions of its muscular fibres. In the beginning the pain is felt about the navel, but later it is localized on the right side, and is accompanied with tenderness. There is no fever or other constitutional disturbance unless there is inflammation of the organ. Appendicular colic requires the same treatment as the intestinal colic, but if there are any signs of inflammation present no time should be lost before surgical treatment is obtained.

Biliary colic is caused by the passage of a gallstone through one of of the ducts conveying bile. It comes on suddenly, often in the middle of the night a few hours after a meal. The pain is severe, is felt on the right side just below the margin of the ribs, and may radiate from there to the back, right shoulder and right arm, or it may be felt on both sides. The patient is restless, rolls in bed in great agony, is drenched in sweat, has nausea, vomiting and sometimes rigors and fever. The pain decreases after a time and gradually passes away, or it may persist with intermissions for several days, or it may stop as suddenly as it started if the stone passes into the bowel or falls back into the gall bladder. Jaundice may appear a day or two after the attack.

All cases do not terminate so favourably, as the stone may remain in the duct and block the passage of bile and produce distension of the gall bladder followed by septic inflammation, or it may ulcerate its way into the intestinal canal or on the skin which may result in a spontaneous cure. If it ulcerates its way into the peritoneum it may cause fatal peritonitis. As its prolonged presence in the gall bladder producing constant irritation and chronic inflammation is liable to cause cancer of the organ, it is very necessary to obtain surgical help as early as possible.

For the immediate relief of pain a hypodermic injection of morphine and atropine is given. Hot fomentations are useful in mitigating the pain. Diet is an important factor in preventing the recurrence of the trouble. During and for some time after the attack all solid food is to be avoided and the diet to consist of skimmed milk from which all cream is removed, vegetable soup, boiled vegetables, rice, biscuits, etc. Later, toasted bread, lean meat, poultry, fish and cereals may be added. All fatty food, eggs, pork, cheese, brain, pastry, spices and alcohol are to be avoided. Olive oil, plain or mixed with orange juice in one to two ounce doses twice daily, prevents the formation of stones, and if one is formed, facilitates its excretion. If the bowels are inclined to be constipated, one grain of calomel at bed time, followed the next morning by sulphate of magnesium in plenty of water twice weekly, is very beneficial. Salicylate of sodium (No. 85) taken twice a day increases the flow of bile and prevents the formation of stones. Mineral waters, such as Vichy, Carlsbad, Evian, Contrexeville, etc. are beneficial. An inexpensive mineral draught can be prepared at home by dissolving 30 grains of sulphate of sodium, 20 grains of bicarbonate of sodium and 15 grains of phosphate of sodium in a tumblerful of water. This is taken twice a day. Sulphate of magnesium is very efficacious in increasing the flow of bile.

Renal colic is caused by the passage of a small stone, blood clot, or gravel from the kidney through one of the ureters to the bladder. As long as the stone remains stationary in the kidney it may not produce any symptoms, but when dislodged from its place by running, jumping, riding or jolting it falls into the ureter and gives trouble. The pain comes on suddenly and without any warning and is very severe. It starts on one side of the back and radiates to the front towards the groin, external genitals and the inner surface of the thigh and is aggravated on movement. Nausea, vomiting, cold sweat and a feeling of faintness are present. There may be a frequent desire to pass water but the quantity passed at a time is scanty and may contain blood. The pain stops suddenly if the stone drops into the bladder or slips back to the kidney ; in the former case it may be expelled with the urine, and in the latter it may bring on another attack. If it gets lodged in the lumen of the ureter it stops the flow of urine which collects above the site of obstruction and in course of time destroys the secreting substance of the kidney and converts it into a large cyst containing urine. The condition is known as *hydronephrosis* (q.v.), and if suppuration takes place in it, it is called *pyonephrosis* (q.v.).

During an attack the pain can be relieved by a hypodermic injection of morphine and atropine. If the stone is not passed in the urine, an examination with x-rays is necessary to determine its size and situation.

If too large to come down to the bladder or through the urethra an early surgical operation is very advisable as the stone has a tendency to increase in size. The preventive measures consist in taking plenty of water, barley water, lemon juice, weak tea, etc., so as to increase the quantity of urine and prevent the precipitation of salts from it, the administration of alkaline salts (No. 75) and avoidance of red meat, spices and alcohol. Poultry, fish, milk, vegetables and cereals may be taken. Milk of cocoanut, i.e., the fluid found in the unripe fruit is a good diuretic and is said to be a preventive against gravel.

CONSTIPATION. Constipation is a functional derangement of the large intestine in which its contents are retained for an abnormally long period, or are unusually hard and difficult to expel, or are incompletely evacuated. Muscular movements of the intestinal wall are provoked by the presence of solid matter in the intestine, but if the residue is not sufficient in quantity, or if the muscles of the bowel have lost their tone, stagnation takes place and constipation is the result. The longer the contents remain in the colon the harder they become on account of the absorption of fluid from it. The causes which contribute to the production of this trouble are common under the civilized conditions of life, while primitive people who lead a natural life rarely suffer from it.

Among the more important causes are :—(1) Faulty diet. As a certain amount of solid residue is necessary to stimulate the intestinal muscles, all articles of diet which leave little or no solid matter after digestion, such as milk, meat, fish, white bread, potatoes, polished cereals, etc., tend to produce constipation. Diet deficient in vitamins is also responsible for it. (2) Insufficient water. A certain amount of water is necessary to dilute and soften the waste product of digestion which become hard if the quantity of water is not sufficient. In hot weather, when a good deal of body fluid is depleted through the skin, constipation is fairly common. The same thing happens in diabetes in which the fluid is depleted through the urine. (3) Faulty habits. When a sufficient quantity of waste matter accumulates in the bowel it gives rise to a feeling of discomfort and a desire to evacuate it, but if this call is habitually disregarded, it passes away for some hours and in course of time becomes feeble and disappears altogether. This is a common cause of constipation among women, especially school girls, who, through a false sense of modesty, put off the desire thereby laying the foundation of a troublesome complaint. (4) Sedentary habits and want of sufficient exercise. Persons, who are engaged in sedentary occupation and do not take exercise, are usually troubled by it. It is a common experience of many persons to suffer from it on a long railway journey or sea voyage. (5) Loss of muscular tone. The intestinal muscles are also involved when the body muscles lose their tone. (6) Addiction to certain drugs. Opium, alcohol, spices, etc., are very constipating. (7) Frequent use of strong purgatives lowers the tone of the intestinal muscles and predisposes to constipation. (8) Constant worry and nervous tension. These produce constipation in some, while in others it has the opposite effect. (9) Heredity. In some families it is hereditary, many of whose members suffer from it from their childhood. (10) Some children suffer from birth without any obvious cause, but get over it when they grow up. (11) Chronic lead poisoning. Painters, plumbers, compositors and others who constantly handle lead or its salts suffer from obstinate constipation. (12) In many acute diseases it is a common symptom, but disappears with the original complaint.

Constipation affects different persons differently ; some persons with very obstinate constipation feel no inconvenience even though the bowels do not move more than once or twice a week, while others are worried and upset if the regular daily movement does not take place. The general health may not be affected for some time, and apart from a bad taste in the mouth and furred tongue there may be no other inconvenience, but if continued for long it tells on the general health. Some of the symptoms produced by it are a feeling of distension of the stomach after food, belching, yawning, foul breath, apathy for any kind of physical or mental work, irritability, sleeplessness, a state of anxiety and unnecessary worries. Muddiness of the skin, acne, pimples and boils may also be present. But all these symptoms are not present in all cases. In asthmatic subjects it often brings on an attack which is relieved by a purgative. The constant presence of hard lumps of faecal matter in the intestine causes irritation, as a result of which a small quantity of thick mucous and a little faecal matter are frequently evacuated which simulates dysentery. Piles, fissure, ulceration or chronic inflammation of the colon or rectum may result from it.

The first step in the treatment of constipation is to remove the cause and adopt a diet containing a sufficient quantity of solid residue to stimulate the intestinal muscle. For this purpose the diet should contain a liberal quantity of whole wheat bread, bran cooked in different ways, oatmeal, unpolished cereals, green vegetables, fresh fruit and nuts. The quantity of meat, poultry, fish, eggs, and other concentrated foods, should be limited. Fresh vegetables contain, in addition to indigestible residue, vitamins, iron, calcium, phosphorus and other minerals necessary for the maintenance of health. Canned vegetables and fruit are not so wholesome as most of these elements deteriorate in the process of canning. Of the Indian fruits papaya, guava, figs, and mangoes have a laxative action. The food should be eaten slowly and well masticated, the mouth and teeth kept clean and water or other liquid taken in sufficient quantity, especially after sweating and in hot weather.

Another important measure is the training of the bowel to move daily at the same hour ; this is not difficult with a little patience. This is done by paying a visit every morning at the same hour to the bathroom and remaining on the commode for twenty minutes without straining, the best time being a little after breakfast. Earlier attempts may not be successful, but in course of time a favourable result is bound to come about. A glass of warm water taken at bedtime and another early in the morning will expedite the result. Regular outdoor exercise and exercise involving the abdominal muscles, deep breathing and massage of the abdomen are very helpful. The massage should be carried out for ten to fifteen minutes with the flat of the hand, commencing just above the right groin and running in an upward direction with a little pressure, as far as the margin of the ribs then crossing to the left side and down to the left groin. A wooden ball weighing about four pounds may be conveniently used by the patient himself for the massage. While lying in bed the ball is placed just above the right groin and gently rolled upwards with a little pressure and brought down on the left side.

If the above measures are regularly and intelligently carried out there will be no need to resort to drugs. Hundreds of drugs, salts and patent medicines are daily advertised and millions of rupees thrown away on these unnecessary and harmful medicines. These is not a single case of consitpation which cannot be cured by diet, correct hygienic habits, regular exercise and massage. In a very small proportion of cases it may be necessary in the beginning, and for a short period only, to help the bowels with a mild aperient. A harmless and commonly used remedy is liquid paraffin or petrolatum. This is sold under different trade names, either pure or mixed with some laxative drugs, such as agar-agar, phenolphthalein, etc., to enhance its laxative effect. Half to one ounce of liquid paraffin may be taken once or twice daily soon after food. Its effect is purely mechanical as it acts by softening the contents of the bowel and lubricating the passage. It can be safely given to pregnant women and debilitated persons without any risk. Its only disadvantage is that if taken for a long time or in large doses it passes out by itself without any faecal matter, or leaks out and soils the clothes. In such a case the dose should be reduced or it should be discontinued for a time. Emulsions of paraffin with agar-agar or other laxative drugs are less likely to cause this trouble.

Agar-agar by itself is also a very useful agent for the treatment of constipation. It is also known as Chinese grass or Japanese isinglass, and is prepared from certain sea weeds. It may be taken in porridge, soup, jellies, cakes, or any other food. It has not got an unpleasant taste and does not upset the stomach. Half an ounce of it may be taken daily. It takes three or four days to act and should be continued for a week or longer until it begins to produce the desired effect. Yeast is also useful for the relief of constipation and may be tried if fresh supply is available. If it is not fresh it is likely to upset the stomach and produce cramps. It is available in the form of tablets, powder or dried cakes, and may be taken with or soon after food. A very cheap, wholesome and easily available source of yeast is the juice of the date palm known as *toddi* which contains plenty of yeast, sugar, alkali salts, etc., which are beneficial for the maintenance of health.

As for the drugs, the less they are resorted to the better, as most of them lose their laxative effect with prolonged use and become harmful. Aperient drugs (No. 123 or 124) might be taken for a few days with other measures, and discontinued as soon as the desired effect is produced. Patent remedies, no matter how catching the advertisement, should be avoided. Enemas should be used very sparingly and only occasionally, as their frequent use causes the stretching of the bowel wall, weakens the muscle and produces inflammation of the mucous membrane. If hard lumps of faecal matter are present in the colon, an enema of olive oil or glycerin (No. 13 or 14) is useful to remove them without any trouble. In children it is always preferable to a large enema of soap and water. It should be injected slowly and retained for some time before evacuation. A weak pendulous abdomen in old patients requires a support by a suitable binder.

CONVULSIONS. Convulsions are a series of sudden, violent and involuntary muscular contractions, often accompanied by unconsciousness and followed by exhaustion. They occur at all periods of life, but are more frequent in infancy and early childhood, and are due to various causes which may be trivial in infants. The most frequent cause in infants is malnutrition or rickets, the exciting cause being delayed dentition, indigestion, diarrhoea, dysentery, severe injury, sudden shock from fright, or a severe reaction from vaccination. An injury to the head at the time of birth, which may not be noticed at the time and which may not produce any immediate symptoms, is a common cause. Children born of syphilitic, alcoholic, or epileptic parents are very liable to get them. A convulsive seizure is common in children in the beginning of an infectious disease.

In adults the attacks are usually due to an injury, inflammation, tumour, or syphilitic disease of the brain or its coverings, chronic alcoholism, lead poisoning, epilepsy and uraemia. Severe convulsive attacks occurring in women towards the end of pregnancy or during confiinement, are known as *puerperal eclampsia*, which are very dangerous both to the mother and the child. Certain poisons, notably strychnine, cause violent and persistent convulsions, which may come very soon after swallowing it, and may prove fatal within a short time. The convulsions of tetanus are very characteristic ; the jaw muscles are in a state of constant painful contraction producing lockjaw, while general convulsive seizure takes place frequently from any trivial exciting cause.

Preventive treatment is advisable in all artificially fed or ill-nourished children. Mother's milk if insufficient or unsuitable should be supplemented or replaced by fresh cow's milk, or by one of the many infant foods available in the market, or a healthy wet-nurse employed. Fresh fruit juice and fish liver oil should be administered in suitable doses and the child exposed morning and evening to mild sunlight. During an attack the child should be put in a hot bath in which a little powdered mustard is added, and cold compresses applied to the head. While this is being prepared an enema should be given. If the attack is severe and persists, 1 to 2 grains of chloral hydrate or 3 to 5 grains of bromide of potassium in a little water should be given by the mouth. In case the child is unable to swallow, double the quantity of the above might be given slowly per rectum. In very violent and persistent cases it may be necessary to give a whiff of chloroform to produce relaxation of the muscles.

For convulsions in grown up persons due to brain trouble, epilepsy, tetanus, hysteria, strychnine poisoning, etc., treatment suitable to each condition is required. During an attack the patient should be kept in bed and protected from doing himself harm, but no violent restraint should be applied so as to avoid the risk of injury to the bones or muscles. In the absence of medical help, 20 grains of potassium bromide or 15 grains of chloral hydrate in an ounce of water might be given by the mouth and repeated after three hours if necessary ; but if the patient is unable to swallow, double the quantity of the above might be given per rectum. After the attack has subsided, 2 to 3 grains of luminal might be given if there is any indication of its recurrence. The patient is kept in bed until he gets over the exhausting effects of the attack.

Puerperal eclampsia (q.v.) is a dangerous condition and should be guarded against by suitable precautionary measures during pregnancy.

CORYZA or common cold. Everyone is familiar with this frequent and troublesome complaint. It is common when sudden climatic changes take place, as in the beginning of the spring or autumn when it is prevalent in an epidemic form, but sporadic cases occur during the whole year. It is not the cold so much as the sudden change of temperature to which the body is subjected that brings on the attack. Sudden chilling after exercise when the body is fatigued, going out from a heated room inadequately protected, or prolonged exposure to the chilling effect of a fan when the body is wet, are some of the causes. The infection is spread in the fine spray produced by sneezing, coughing, or shouting. In some individuals inhalation of dust or fumes brings on an attack. The administration of certain drugs, such as iodides and preparations of iodine, produces in susceptible persons severe symptoms of coryza. In hay fever (q.v.) similar symptoms are produced in allergic subjects.

The inflammation starts from the nose, throat or larynx and spreads to other parts and sometime into the sinuses, i.e., the hollow cavities in the bones of the face, where it may produce suppuration and require surgical treatment. The early symptoms soon get aggravated, the mucous membrane of the nose gets swollen and causes obstruction to nasal breathing. The discharge, which is thin and watery, becomes purulent, and headache, lassitude, slight rise of temperature, impaired appetite and loss of sense of smell and taste are present. Dry irritating cough is present and disturbs the sleep. The acute stage begins to subside after three or four days but the nasal discharge continues for some time longer. Similar symptoms are sometimes present in the beginning of some infectious fevers.

Preventive measures against coryza consist in avoiding contact, during an epidemic, with infected persons as occurs in cinemas, theatres and other crowded places, protecting the body against cold draughts, especially after a bath or exercise, and maintaining good health by exercise, regular habits and sufficient rest and sleep. Patients suffering from coryza, who are otherwise in good health, need not remain in bed unless they have fever. The body should be protected with warm clothing and the feet kept dry and warm. So far there is no medicine that will cut short an attack, but the troublesome symptoms can be mitigated by the common household remedy, viz., a warm decoction of cinnamon bark, black pepper and dry ginger with a little brandy, and sweetened with honey, taken at night at the beginning of an attack. The patient should go to bed immediately after taking it and cover himself with a blanket to induce sweating. Aspirin and caffeine powder (No. 135), taken with the decoction, will relieve headache and pain in the limbs and stimulate sweating. For irritating cough, mixture No. 61 will be useful. Nasal irritation can be relieved by frequently sniffing warm saline solution containing a teaspoonful of common salt in a pint of water. A mixture of oil of turpentine, eucalyptus oil and tincture of benzoin sniffed frequently is also useful in nasal irritation (No. 34). It is put in a small wide mouth bottle which is filled up with absorbent cotton to prevent the liquid from spilling. A saline purgative is useful even when the bowels are not confined.

COUGH. Cough is merely a symptom associated with some trouble of the respiratory organs, or some other part of the body indirectly connected with them. It is an attempt by the body to get rid of an abnormal secretion or a foreign body that might be present in the respiratory tract. When the cause is located in some other organ it is called reflex or indirect cough. It is common in children and may be due to an irritation in the stomach, ears or tonsils. The pressure on the air passages of enlarged lymph glands or thyroid, a tumour in the chest, constant irritation of the larynx by an enlarged uvula, and congestion of the lungs in heart disease, are among the causes that produce cough. It is present in diphtheria, measles, influenza, whooping cough, typhoid fever, and other acute infectious diseases. In asthma there is a dry unproductive cough during the interval between the attacks. When it is due to an inflammatory condition it is accompanied with fever and other characteristic symptoms of the disease.

In the early stages of an inflammatory condition the cough is dry with a feeling of tightness and burning in the chest and air passages. Purulent expectoration is common in chronic bronchitis, pneumonia, tuberculosis, and abscess of the lung. Pure pus is suddenly expectorated when an abscess in an adjoining organ bursts in the lungs. Cough may be paroxysmal, the patient being free in the intervals as in whooping cough and asthma. In chronic bronchitis and advanced tuberculosis such paroxysms are common in the morning when the patient gets out of bed, because the secretion accumulates during the night and the change of position causes irritation and the cough continues until the lungs are emptied. Hysterical persons get a dry cough when they are under observation. Some persons are easily affected by climatic conditions and get cough every cold weather.

The treatment of cough differs according to the condition which gives rise to it. In children, apart from any trouble of the respiratory organs, the cause may be inflamed tonsils, enlarged uvula, diphtheria, enlarged glands in the neck, inflammation in the ears, or the beginning of measles, whooping cough, asthma, typhoid fever, or stomach trouble. In case of cough in children a thorough examination of the mouth, nose, throat, tonsils and ears is necessary ; the body should also be examined in good light for any rash or discoloration that might be present. The temperature should be recorded every four hours commencing from 8 a.m. as the rise of temperature is an indication of the presence of inflammation, but in children any slight digestive disturbance causes a rise of temperature. Fever is absent in asthma, whooping cough and when there is no inflammatory condition present. The treatment of the different conditions of which cough is a symptom, has been described under their different heads. In children when it is due to stomach trouble the diet should be regulated and the bowels cleared with a little castor oil or milk of magnesia. Alkaline mixture No. 101 is useful in dyspepsia.

CRAMP. It is a painful and sudden involuntary contraction of a muscle or a group of muscles and is produced when the circulation is defective in the part due to thickening of the arteries in old age or some disease in the young. In young persons it is often due to fatigue, in which case it does not recur frequently and requires no special treatment except rubbing the affected part, applying heat and stretching the limb so as to extend the muscles. In old age its recurrence is frequent, in which case regular massage, fomentations and protection of the part with flannel are necessary. Some persons are attacked while swimming which throws a good deal of strain on certain set of muscles ; fatal accidents are likely to happen in such cases. A person attacked while swimming should get out of water at once, but if he is unable to do so, he should stretch his limbs and float on the back until help arrives.

It is a very distressing symptom in cholera and most of the muscles are involved when the tissues are depleted of fluid due to persistent vomiting and purging. In tetanus the muscles of the neck and jaw are attacked first with a constant spasm which soon spreads to other parts. Spasmodic or constant contractions of muscles are produced in some diseases of the nervous system.

A very painful and troublesome variety of cramp affects certain small muscles of the fingers which are constantly used in some occupation requiring fine movements, such as writing, typing, handling the telegraph key, playing music, etc. It is named after the occupation of the patient, e.g., writer's, typist's, or musician's cramp. It affects young neurotic persons, and may come on after an illness or without any apparent cause. It comes on as soon as the patient begins to work, and he is unable to carry on. He can make use of the limb for all other work without any trouble. The condition is very persistent, and unless taken in hand early it is likely to become chronic. Some patients learn to use the left hand, but it also gets affected in time.

The treatment is to give the hand complete rest as soon as the early signs make their appearance. The movements which are painful should be avoided and the left hand used very sparingly. The general health should be maintained by outdoor exercise, nourishing food, tonics (No. 77), sufficient rest and sleep. Deep breathing, muscular relaxation, massage of the hand and fingers, avoidance of an excessive use of alcohol and, if possible, a change to a bracing climate are beneficial. The hand should be sparingly used when the symptoms disappear and for short periods at a time.

DELIRIUM. Delirium is a temporary mental disturbance marked by excitement, hallucinations, delusions, incoherent speech and physical excitement or depression. It occurs in the course of many infectious diseases, high fever, toxic conditions, insanity or injury to the head. In the violent type the patient is restless, excited, violent, and tries to run away and harm himself or others ; but when his condition is low he lies quiet, mutters to himself in a low voice, and has twitching of the muscles of the fingers. Such a state is found when his strength is giving out. In acute delirium, which usually ends in death, the onset is sudden during the course of an illness, the patient becomes very restless, excited and difficult to control.

Delirium does not require any special treatment apart from that needed for the original complaint. Sedative drugs are to be avoided as far as possible and morphia or the preparations of opium are rarely prescribed. Sodium or ammonium bromide alone or with chloral hydrate (No. 87) may be given to quieten the patient. The patient requires careful watching day and night to prevent him from running away and doing himself harm. If violent and uncontrollable, some kind of restraint will be necessary, but in applying this care should be taken to prevent any damage to his bones or joints.

DELIRIUM TREMENS. This is an acute variety of insanity in which the patient suffers from hallucinations, delusions, physical and mental excitement, mental distress and muscular tremors. Persons addicted to habitual excessive use of alcohol are liable to get it, and males are more often attacked than females. It comes on after an unusually heavy bout of drinking, severe injury, an acute disease, mental or emotional disturbance, or a sudden deprivation of alcohol. The onset is often preceded by restlessness, sleeplessness, frightful dreams and a sense of anxiety, or sometimes by a dislike for alcohol. This stage lasts for two or three days, but is short when it is a complication of an infectious disease or an injury. During this period the patient has tremors, an anxious distressed expression, stuttering speech, and an unsteady gait. When it is fully developed he has terrifying hallucinations, sees snakes and wild animals in bed or crawling on the walls, or hears sounds, and has sleeplessness. This lasts from three to ten days, and in cases which are going to terminate favourably, the patient falls into sound sleep for hours and wakes up free from hallucinations and asks for nourishment, but the memory remains confused and he is unable to recall any details of his illness.

As soon as the early symptoms make their appearance the patient should be put to bed and kept on light liquid diet. Mild sedatives (No. 65) are given to induce sleep, but opium and its preparations should be avoided. The stomach is inactive during delirium and if drugs are given too frequently by the mouth they accumulate and get absorbed when reaction sets in and may prove fatal. In the beginning four grains of calomel at bedtime, followed the next morning by a saline aperient, is given to unload the bowel. If the patient is unable to take any nourishment by the mouth, nutrient enemata (q.v.) are given at regular intervals. A hypodermic injection of 1/10 grain of apomorphine with 1/32 grain of strychnine has a quietening effect in violent delirium.

DIARRHOEA. Diarrhoea, i.e., frequent evacuation of the bowel, is a symptom in many conditions. It may be acute lasting for 2 or 3 days, or chronic lasting for months or years, or it may be intermittent. Among the causes that produce diarrhoea are the presence of an irritating substance in the intestine, strong purgative, overloading the stomach, exposure to cold, certain articles of diet, bacterial infection of food or irritant poisons. In some nervous individuals an emotional disturbance brings on an attack. It is a prominent symptom in cholera and typhoid fever. In kidney disease when the excretory function of the organs is deficient diarrhoea sets in by way of compensation, and in such cases it is not advisable to stop it altogether. The number of stools in twenty-four hours may be from four to thirty or more ; their consistence and colour vary a good deal according to the condition responsible for it. In inflammation of the intestine it is accompanied with griping and straining at stools. In children the most common cause of acute diarrhoea is unsuitable or faulty diet, and in chronic cases it is rickets. In adults, chronic diarrhoea is mostly due to sprue or intestinal tuberculosis.

The treatment depends on the cause which should be removed. In children faulty diet should be corrected and regular hours of feeding should be observed. The administration of castor oil or magnesium sulphate in the beginning is useful in getting rid of the offending substance, but if the diarrhoea has been for some time this is not necessary It should also be avoided in case of great weakness and collapse, but if it has to be given it should be given with a little brandy, hot tea or coffee. Severe diarrhoea can be controlled by ten minims of laudanum, chlorodyne or camphrodyne, which will relieve colicy pain also. It should not be given to children under one year and proportionately smaller doses are given to older children, and should not be repeated. Preparations of opium are contra-indicated for very old persons and those suffering from heart or kidney disease. Mixture No. 64 and powder No. 134 contain opium and may be used for diarrhoea subject to above precautions.

The stomach and intestines need complete rest for 12 to 24 hours, during which no food should be taken except tea, coffee or broth. Later on milk, toast, biscuits and boiled custard might be taken and the ordinary diet restored gradually. Diarrhoea in nervous persons, caused by emotional disturbance requires no treatment except rest and light diet. An excessive loss of fluid in severe diarrhoea is likely to cause collapse in children and old persons, requiring stimulants and replacement of the fluid by intravenous injection of saline solution ; but if this is not available saline might be given per rectum (see No. 15). Constipation usually follows an attack of diarrhoea, especially if an astringent medicine is taken. In such cases paraffin or castor oil might be taken.

DIFFICULTY OF BREATHING (Dyspnoea). Normal breathing requires no conscious effort to expand the chest and the respiratory movements are automatic in sleep as during waking hours. In dyspnoea the effort is noisy, requires force, and the muscles other than those ordinarily used for respiration are called into action. The trouble may be due to a foreign body in the air passages, their compression, disease of the respiratory organs, heart or kidneys, some general disease, such as asthma, diabetic coma, etc., or narcotic poisoning.

In children the obstruction in the nose is due to the introduction of coins, pebbles, seeds, etc. If the object is small it may produce no symptoms, but it sets up septic inflammation, and there is a risk of its being drawn into the lungs. If it is close to the nostril and not too large it can be removed with a small scoop or forceps. It is possible to remove it by syringing or douching through the other nostril. The child is made to sit in a chair and asked to breathe through the mouth, the nozzle of the syringe or the irrigator is introduced into the opposite nostril and a solution of common salt (one teaspoonful to a pint of water) allowed to run with moderate force. The stream travels to the back of the nasal cavity and is directed from behind into the other nostril and the foreign body will be pushed out from behind. If the foreign body is lodged in the throat or the larynx it may be possible to remove it with a pair of forceps or scoop it out with the forefinger. Care should be taken not to push it down. Holding the child with the head down and stroking the chest or the back may dislodge the body if it is smooth or round. Chronic nasal obstruction in children is due to adenoids (q.v.). In old persons the obstruction is often due to a badly fitting tooth-plate being displaced and drawn into the larynx while shouting, laughing or coughing ; usually it lodges in the larynx and can be easily removed. Small objects might pass down and cause fatal choking or septic pneumonia.

Dyspnoea is a very distressing symptom in heart disease, and in bad cases the patient is unable to breathe in the recumbent position and has to sit up in bed. It occurs in kidney disease when its excretory function begins to fail and uraemia sets in, and unless it is soon restored, a fatal termination is certain. In diabetes, when coma supervenes, the breathing becomes deep and laboured without any obstruction, and the breath has a peculiar fruity odour. In hysteria, the patient sometimes complains of difficulty of breathing and a choking feeling as if a ball were rising in the throat. This subsides without any trouble if the patient is left alone.

DIFFICULTY OF SWALLOWING (Dysphagia). In this condition the act of swallowing is difficult and painful. It may have a sudden onset or may come on gradually and get worse in course of time. Like dyspnoea it is a symptom and is due to some trouble in the mouth, throat, larynx, gullet or outside the alimentary tract. An acute attack in children is often due to the presence of a foreign body getting impacted in the throat, while in adults a fish bone or a displaced tooth-plate is very often responsible for the trouble. Any painful condition of the mouth, tongue, throat, larynx or gullet, such as diphtheria, abscess of the tonsil, ulceration or stricture of the gullet is likely to cause it. Gradually increasing obstruction in old persons is generally due to cancer of the gullet. The diseases unconnected with the alimentary system in which it is present are tetanus, hydrophobia, general paralysis of the insane, hysteria, and the pressure of a tumour on the gullet.

A foreign body, if not lodged too low, can be removed with the fingers or a pair of forceps. To get a good view the head is thrown well back when the patient is sitting in a chair, the mouth opened wide and the tongue depressed with the butt end of a spoon. An electric torch is useful in ligthing the back of the mouth. A fish bone impacted in the throat or the back of the tongue can be removed with a pair of forceps or by gently scraping with the finger nail, but if it is beyond reach and not large it can be pushed down by swallowing some coarsely masticated bread. Failing this surgical help becomes necessary. In chronic cases surgical treatment is the only method that is likely to give relief.

DROPSY. Dropsy is a symptom and means a swelling of the body or a part of it on account of an abnormal accumulation of fluid in the loose subcutaneous tissues or in one of the cavities in the body. It may occur in a limb whose circulation is partly obstructed by a ligature. The swelling is soft and when pressed with fingers leaves a depression which fills up gradually. This is called *pitting* on pressure, and the swelling is called *oedema.* The conditions in which it occurs are : (1) heart disease. When the heart becomes inefficient as a pumping organ fluid accumulates in the most pendent parts and gradually spreads upwards as the condition of the heart gets worse until the whole body is involved. (2) kidney disease, in which the swelling first appears on the face and eyelids and does not completely disappear on rest. (3)

Cirrhosis of the liver, in which the fluid first accumulates in the abdomen. (4) Diseases of the peritonuem. (5) Advanced anaemia, in which there is puffiness of the eyelids and swelling of the ankles. (6) Nutritional disorder known as beriberi. (7) Epidemic dropsy, commonly seen among famine striken people. (8) Mechanical obstruction to the circulation in a limb, in which case it is confined to the limb. The treatment naturally consists in remedying the condition responsible for it. When the fluid in the abdominal or thoracic cavity becomes so much as to press on the heart it can be removed by tapping, but the relief afforded is temporary.

DYSPEPSIA. It means impaired digestive function of the stomach which may be acute and of a short duration, or chronic persisting for a long period. It may be primary, i.e., when the cause is in the stomach ; secondary when the cause is located in some other organ ; and nervous when due to mental distrubance.

Primary dyspepsia, when not due to an organic disease of the stomach, is the result of dietetic errors, unsuitable or improperly cooked food, irregular hours, overloading the stomach, bolting the food without properly masticating it, defective teeth, a bout of strong drinks, or a chill on the stomach. It is also caused by an inflammation or organic disease of the stomach. In dyspepsia of chronic gastritis and cancer of the stomach the acid is deficient or absent from the gastric juice. Secondary dyspepsia is found in chronic inflammatory conditions of the liver, gall-bladder or appendix, diseases of the kidneys or heart, and anaemia. Dyspepsia of nervous origin is met with in neurotic individuals, who lead a solitary life and brood over trivial complaints from which they might be suffering. They have a worried look, suffer from headache and palpitation, and soon get tired after very little physical or mental work. There is no relationship between the quality or quantity of food taken and the stomach trouble, as in a cheerful company at meals any food is digested without any trouble.

The symptoms are a feeling of fullness and heaviness after food, excessive thirst, flatulences, eructation, palpitation, heaviness in the head, lassitude after meals and either diarrhoea or constipation. In acid dyspepsia the appetite is not usually diminished, but even a small quantity of food produces a feeling of distension and discomfort.

Acute dyspepsia is of a short duration and is readily amenable to treatment, and as soon as the cause is removed the stomach resumes its normal function. In persistent cases a thorough investigation is necessary to determine the cause : for this purpose the help of x-rays, test meals, etc., is necessary. Defective teeth require attention. When the symptoms are severe the stomach requires complete rest for 12 to 24 hours, after which very light food is to be taken, and at regular intervals until normal food can be taken without any difficulty. A saline purgative is useful in removing indigestible matter from the bowel. No more than three meals, including a light breakfast should be taken and nothing between meals. Complete physical and mental rest at least for half an hour before meals is advisable. The food should be appetising and well cooked, and should contain all items including green vegetables ; it should be well masticated and taken, if possible, in cheerful company. Very cold drinks and free use of liquids during meals should be avoided, as also the use of strong purgatives. Neurotic patients require complete change of scene and company.

With the above measures there would be no need to have recourse to drugs, except in very few cases. Alkaline stomachics (No. 52), thrice a day, half an hour before meals, are useful in stimulating the secretion of the stomach. All drugs should be discontinued as soon as the function of the stomach is restored. When the secretion of the hydrochloric acid is deficient the dilute acid (No. 50) is useful after meals. Pepsin, papain and taka-diastase (No. 136) taken with or soon after meals help digestion.

ENURESIS (Bed-wetting). This troublesome complaint is a source of great anxiety to parents, and requires great tact and patience for its successful treatment, otherwise it is likely to leave a permanent harmful effect on the mental well-being of the child and adversely affect his future. An infant under twelve months has no control over its bladder, which is emptied involuntarily as soon as it is full. After this period it begins to have a certain amount of control, and with a little training the spontaneous evacuation of the urine stops, and the child cries whenever there is a call. It is very important to pay prompt attention to it as the control over the bladder is weak. The child should be encouraged to empty the bladder at regular intervals, and before going to bed. The trouble may arise from improper feeding, intestinal worms, highly acid urine, stone in the bladder, food allergy, or a hereditary tendency. It is fairly common in children who are subject to asthma, urticaria, or other allergic manifestations. Usually the child gets over the trouble before puberty. In some cases it may continue much longer and even after the cause is removed, in others, no apparent cause can be found and the child remains free for weeks or months, but may have incontinence after this two or three times a week.

There is no medicine which has a specific effect on the trouble and the only method, which has a fairly good chance of success, is the education of the child. For this purpose it is important to seek his co-operation without any scolding or threat of punishment. He should be instructed to hold the urine as long as possible during the day, and gradually increase the time to six or seven hours, and void the bladder at regular intervals only. In many cases this is enough to effect a cure. The diet should be light at night, and the last meal taken not less than three hours before going to bed. The intake of fluid should not be unduly restricted, as this does not make any difference, but may, on the contrary, induce enuresis by making the urine concentrated which irritates the bladder. If the urine is highly acid in reaction, an alkaline mixture (No. 93) might be given thrice daily. A record should be kept of all the articles of diet taken so as to find out if the child is allergic to any particular item. There may be more than one such substance. The child should be made to pass water before going to bed, but should not be awakened from sleep to empty the bladder, except in very bad cases. Intestinal worms, if present, should be removed as soon as possible. The child's trouble should never be referred to in the presence of other children.

FAINTING (Syncope). Fainting is a sudden and temporary loss of consciousness brought about by various causes. Some neurotic persons faint readily from fear, severe pain, sudden shock, sight of blood,

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over-exertion, etc. Hysterical persons often faint without any cause. Sudden excessive loss of blood, exertion on an empty or overloaded stomach, heat and unpleasant smell of a crowded room, and weakness or disease of the heart are some of the causes of fainting. The person about to faint becomes pale, feels giddy, has a blank expression, and is covered with cold sweat when he suddenly loses consciousness and drops down.

The first thing to do when a person faints is to keep him in the recumbent position with the head low without a support, and raise his limbs. If he is to be moved his head should not be raised above the level of the body. His collar and necktie should be loosened, and his clothes unbuttoned so as to remove all pressure from the chest. If in a crowded room, he should be taken out, and people should not be allowed to crowd round him. His limbs should be elevated and massaged to drive the blood to the heart. Smelling salts, if available, may be held near the nostrils at short intervals, but should not be kept too near, as the strong smell is very irritating. After the return of consciousness he should be kept in the recumbent position for some time. To overcome the subsequent feeling of weakness, a little dilute whisky or brandy or hot tea, coffee, or a stimulant mixture (No. 89) might be given. A person feeling faint should lie down, if possible in the open, until the feeling passes away. Measures to improve the general health are indicated for those who faint frequently.

Hysterical persons require no treatment when they faint, except some strong smelling salts to the nostrils ; no undue fuss should be made nor unnecessary sympathy shown. For fainting from loss of blood see *Bleeding.*

FETOR OF THE BREATH. This is due to several causes which may be in the mouth, throat, nose, stomach, intestine, or lungs. It is more often perceptible to others than the patient himself. Persons indulging in excessive smoking have a disagreeable smell in their breath due to the excretion of nicotine. Drug addicts, especially opium eaters, have a faecal odour in their breath due to smell of opium and also to constipation induced by it. Chronic alcoholic subjects, especially beer or whisky drinkers, emit an unpleasant odour. Chronic suppuration in the nasal cavities or sinuses, advanced pyorrhoea and septic conditions of the mouth, throat and tonsils are also responsible for it. Gangrene of the lungs (q.v.) produces a very disagreeable smell which fills the whole room. Chronic dyspepsia, when the acid secretion of the stomach is deficient, and chronic constipation are the most frequent causes. The treatment is to remedy the condition responsible for it. Outdoor exercise, relief of constipation and attention to oral hygiene are the necessary measures which should be adopted in all cases.

FEVER (Pyrexia). Fever is not a disease but an important symptom of many diseases, or abnormal conditions of the body. The height of temperature does not necessarily indicate the severity of the disease. In normal health the temperature is 98.6°F, and varies in the course of the day in either direction to the extent of half a degree. After severe exertion it rises a little, but it is not noticed by the subject and soon subsides to normal.

Every infectious disease produces a characteristic type of fever peculiar to itself, and it is often possible to make an accurate guess as to the nature of the disease from the temperature chart. The diurnal variation of temperature is usually noticeable in disease also. Three types of fever are recognized according to daily variation, viz. (1) *Continuous type*, in which the temperature is well above the normal, and the daily variation is not more than a degree or so. It is found in pneumonia, typhus, scarlatina, and relapsing fever. (2) *Remittent type*, in which the daily variation is more than 1.5 degree, but the lowest does not reach the normal limit. It is seen in the first and the third week of typhoid, septicaemia, etc. (3) *Intermittent type*, in which there is a marked daily variation and the minimum reaches the normal line. It is common in malaria.

The rise of temperature is brought about by a disturbance of the heat regulating mechanism in the body. In practically all infectious diseases, except cholera, it is the first symptom to usher in the disease. It is a protective effort on the part of nature, as the high temperature reduces the activity of bacteria and kills them when exposed to it for a long time. If it is of a short duration it has little harmful effect on the body, but if it continues for a long time, it causes degeneration of the skeletal and heart muscles and brings about prostration. It is therefore necessary in a prolonged disease with fever, to conserve the strength and energy as much as possible from the beginning, as every ounce of energy saved helps the patient to tide over the critical period. Every patient with fever, however trivial it might be in the beginning, should be put to bed and all necessary precautions taken as if it were going to be a case of serious illness until a definite diagnosis is made. Many a patient has lost his life for want of this precaution. In typhoid fever, for the first three or four days the symptoms are mild and the patient struggles with his work, dissipating his strength which is likely to turn the scales against him during the critical period.

The symptoms which accompany fever are acceleration of the pulse and respiration, impaired appetite, constipation, thirst, headache, restlessness, sleeplessness, scanty high-coloured urine, pain in the limbs and back, and a feeling of discomfort. Delirium is present when the fever is high in toxic conditions. All these vary in severity according to the nature of the disease.

It may not be possible to determine the nature of the disease responsible for the fever for some time, but in the meantime the patient should be put to bed and not allowed to leave it until the temperature has been normal for some time, and he feels strong enough to move about. He should be provided with a bedpan and urinal whenever necessary. If there is no inclination for food nothing should be given for 12 to 24 hours except barley water, tea, coffee or lime juice and water. The diet is an important part of the treatment in fever ; it should consist of milk, sago, arrowroot, boiled rice with milk or broth, milk puddings, sponge cake, boiled fish, egg flip, soft jellies, vegetable soup, buttered toast and minced chicken. The above items may safely be used for patients suffering from typhoid fever.

There are many diaphoretic drugs which induce perspiration and lower the temperature, such as phenacetin, aspirin, antipyrin, etc., but most of these are depressant and harmful if used for a prolonged period, and the temperature lowered by them shoots up again leaving the patient in an exhausted condition. Aspirin and citrate of caffeine powder (No. 135) given occasionally is useful, and relieves headache and pain in the limbs, but it should not be continued for long. Diaphoretic mixture (No. 74) might be continued safely in fever from any cause. For restlessness and sleeplessness one dose of No. 65 might be given one hour before bedtime. Quinine, which is so often taken for fever, is not of much use except in malaria, and its indiscriminate use is likely to be harmful. For constipation a mild saline purgative, or an enema is all that is necessary ; violent purgatives should be avoided. For thirst plain water or barley water sweetened with glucose and flavoured with fresh lemon juice might be given in moderate quantities as often as required by the patient ; fresh orange juice is very refreshing and improves the taste.

Ice-bag to the head and cold compresses to the abdomen may be applied constantly as long as the temperature is above 101°F. For the cold compress, four or five layers of absorbent lint or of some clean white cotton cloth about six by eight inches in size, are soaked in ice-cold water or an evaporating lotion (No. 42) and spread on the abdomen after being squeezed a little to prevent water dripping from it. This is replaced as soon as it becomes warm or dry. Hydro-therapy is now much used in the treatment of high fever if it continues for long as in typhoid fever, sunstroke, etc. It lowers the temperature and has a refreshing effect on the patient. There are three ways in which hydrotherapy can be applied, viz., sponging, wet-pack, and cold bath, any of which may be used according to circumstances and convenience. Whatever the method employed the patient should be disturbed as little as possible. In the absence of a trained nurse the following instructions will be useful.

For cold sponging the patient should be stripped and covered with a bed sheet and a waterproof sheet spread under him. Each limb is taken separately, and a large piece of sponge or lint, which is soaked in cold water containing a little cologne water or toilet vinegar, is gently rubbed on the limb after the excess of water has been removed from it. The limb is treated in this way for about five minutes, after which it is dried with a soft towel, and rubbed so as to stimulate the circulation in it. Other limbs, chest, face and neck are treated in the same way, but the abdomen should be omitted in typhoid fever. An ice-bag is kept on the head when the sponging is being done. When all parts are finished, the patient is covered with a light blanket, given a little brandy, and allowed to rest. The process might be repeated after some time if the temperature rises, provided the patient is not exhausted.

For wet-pack, the bed is covered with a large waterproof sheet on which a warm blanket is spread ; two cotton sheets are soaked in a bucket of cold water in which a lump of ice is put ; the patient is turned on one side and one of the sheets spread on the bed. The patient is now turned so as to bring him to the centre of the bed ; he is then covered with the other sheet and a blanket spread over him. After about ten minutes these sheets are replaced, or if it is not advisable to disturb the patient, the same sheets are cooled by rubbing ice on them or spraying cold water. During the pack the patient's temperature is taken at short intervals and when the rectal temperature has come down to 102°F the pack is discontinued, the patient rubbed dry and given a little stimulant, and allowed to sleep. The pack should be discontinued if at any time the skin of the face and hands becomes blue, or the patient gets a shivering fit, in which case the sheets are removed, the patient dried quickly and given a little stimulant.

The cold bath is given by placing the patient in a bath tub containing water at 85° Fahrenheit, which is slowly brought down to 70° by the addition of cold water; the temperature should not be brought down too rapidly or below 70°. In the beginning the patient is kept in the bath for about five minutes only, and the time gradually increased to fifteen provided he does not show signs of discomfort or collapse. After he is removed from the bath the body is dried with gentle friction, his clothes put on and he is given a little stimulant and allowed to sleep. In order to save him much exertion or when help is not available a bath may be improvised in bed. A large rubber sheet is spread under the patient and over the pillow, and a roll of blanket inserted on each side of him under the rubber sheet; these with the pillow form three sides of a trough which is completed by placing another small roll at the foot of the bed. A better plan is to omit the roll at the foot and raise the head of the bed a little so as to allow the water to run into a bucket. The patient is sponged liberally from a pail of water at 80°F, or the water is poured over him with a mug, at the same time rubbing his body with a piece of cloth. After five minutes he is dried, clothed and covered with a blanket. The bath may be repeated three or four times during the day if necessary.

FLATULENCE. Flatulence is the gaseous distension of the stomach and intestines, and is caused by defective digestion, partaking of easily decomposable substances, such as starch, sweets, or certain kinds of fruit, defective secretion of the stomach, intestine or liver, and in some cases hereditary tendency. Persons engaged in sedentary occupations are very liable to get it. The treatment consists in removing the cause. The bowels should be emptied of any indigestible and decomposing stuff that might be present; calomel at bedtime, followed the next morning by a saline purgative is the best for this purpose. The quantity of starch, sugar, and pulpy fruits should be limited in the diet, and if the trouble still persists, a carminative mixture (No. 67) might be taken for a few days. For offensive stools a powder containing five grains each of salol and beta-naphthol taken thrice a day with a little water is very useful.

GIDDINESS (Vertigo). It is a symptom found in many diseases and is characterised by a sense of instability, a feeling of swimming in the head and apparent movement of surrounding objects. It may be due to a disease of the brain or the semi-circular canals which maintain the equilibrium of the body, disordered stomach or liver, defective vision, diseases of the heart or kidneys, anaemia, or toxic conditions. It is a premonitory or warning symptom in epilepsy just before a seizure. Some women suffer from it at the time of menopause. Hysterical patients complain of giddiness and fainting and fall down but without hurting themselves. Persons addicted to excessive use of tobacco, alcohol, or drugs may suffer from it. It may be temporary and of a short duration or permanent according to the nature of the cause. The attacks may be mild and not interfere with the patient's activities, but when due to some disease of the brain or the semi circular canals, they are constant and incapacitate the patient completely.

The treatment is directed towards the relief of the trouble of which it is a symptom. When mild and in otherwise healthy persons it is due to disordered stomach or liver and the remedy is obvious. In children it is often due to defective vision and disappears when it is corrected with glasses.

HEADACHE. It is a symptom found in many conditions. There are few persons who have not suffered from it at some time or other, while there are some who are hardly free from it. It varies in severity, frequency, duration, and location in the skull according to the cause. The causes are :—(1) Some trouble in the brain or meninges, such as inflammation, abscess, tumour, etc., when it is accompanied with other symptoms. (2) Eye strain, which is a very frequent cause in children. It usually comes on after reading or straining of the eyes. (3) Digestive disturbances, starvation, overeating, congestion of the liver, etc. (4) Certain articles of diet in some individuals, tobacco, strong alcohol, beer and some chemicals, such as trinitrin, potassium iodide, etc. (5) Diseases of the circulatory system, such as arteriosclerosis, high blood pressure, anaemia, etc. (6) Disorders of the nervous system, such as neurasthenia and hysteria. Some persons get it during a thunder storm. (7) Uraemia, in which it is severe and is accompanied with other severe symptoms. (8) Many infectious diseases in which it is one of the early symptoms. (9) An injury to the head. (10) After-effect of sunstroke or heat exhaustion. (11) Menstruation in many women who have it regularly during the period. (12) Heredity. Many members of the family get it on slightest provocation. (13) Strong smell. Many persons get it from a strong smell.

The treatment is to find the cause and remove it. For defective vision, stomach or bowel trouble, abuse of alcohol or tobacco, the treatment is obvious. For the immediate relief of headache many drugs are available, most of them being cardiac depressant and harmful if taken frequently. Almost all the patent headache cures contain one or more of these and should be avoided. For an occasional use aspirin with caffeine citrate (No. 135) is fairly safe. An ice-bag on the head is useful for headache accompanying fever. Constant or frequent attacks of headache require investigation as to the cause.

HEARTBURN. The term is applied to a condition in which there is a sensation of burning and discomfort in the chest some time after food, lasting for hours, which is due to acidity of the stomach (q.v.). It has nothing to do with any disease or abnormal condition of the heart, although it is accompanied with palpitation, cardiac distress and other functional disturbances. It comes on about an hour after food, lasts for some hours, and is aggravated by acid food, alcohol, physical strain, etc. As a rule the appetite is not affected and the general health is good.

The treatment consists in correcting dietetic errors and avoiding alcohol, strong tea, coffee, tobacco, excess of salt, spices, and starch. The administration of alkalies with tincture of belladonna (No. 51) before meals is useful in checking the excessive secretion of the acid. For relieving the distress, powder No. 133 in a little water might be taken after food.

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HICCOUGH. It is produced by a sudden short contraction of the diaphragm and is brought on by some trivial cause, such as over-eating, hot spicy food, strong alcohol, etc. Such attacks are mild, of short duration and easily controlled by simple remedies ; but when due to inflammatory conditions of the stomach, intestine, peritoneum or diaphragm, intestinal obstruction, or uraemia, it is severe and persistent and not easily stopped until the cause is removed. It is sometimes found in an epidemic form when it attacks many persons and is very persistent. Some hysterical persons suffer from it for days, but are free while eating and during sleep.

Mild attacks due to dietetic errors can be easily controlled by taking a deep breath and holding it for a minute or so, drinking a little cold water when the breath is held, applying pressure on the stomach, drinking a glass of water in which 30 grains of bicarbonate of sodium are dissolved, distending the stomach by drinking soda water and allowing it to remain distended for some time, or inhaling the smell of burnt black pepper. Obstinate cases are relieved by the application of a mustard plaster on the pit of the stomach. When due to an inflammatory condition of the stomach or bowels the condition responsible for it requires attention.

INSOMNIA (Sleeplessness). It is a symptom present in many abnormal conditions. Individual requirement as regards sleep varies according to age, general state of health, physical and mental work, etc. Infants sleep through most of the day, young children need 10 to 12 hours, older ones require 8 to 10, adults do not usually need more than seven hours, while old persons sleep for six hours or less. Sufficient sleep is necessary for the maintenance of health, as during sleep the body recovers from the effects of physical and mental wear and tear. Insufficient sleep for prolonged periods is harmful and exhausting.

Many neurotic persons complain that they do not get a wink of sleep and remain awake the whole night ; but as a matter of fact they get short or long spells of sleep during the night which they do not remember in the waking state. In otherwise healthy persons insomnia results from overeating at night, excessive use of alcohol, coffee, tea, or tobacco, physical over-exertion, mental strain, a state of anxiety, close ill-ventilated room, excessive heat or cold, uncomfortable or vermin infested bed, high blood pressure, heart or kidney disease, fever, or painful conditions. Neurasthenic patients, suffering from anxiety states and insane persons sleep very little.

The first thing to do in the treatment of insomnia is to remove the cause, which is not easy in every case. Moderate outdoor exercise, regular hours of food and sleep, a hot bath in the evening and a comfortable bed in a well ventilated room are conducive to sound sleep. Persons suffering from insomnia make their condition worse by worrying about it while lying in bed. If sleep does not come soon after retiring, the best thing to do to invite it is to keep the eyes shut, relax all the muscles, particularly those of the face, neck and head which become tense, and try to forget all work and worry. The habit of forgetting the work and worry of the day as well as of relaxing all the muscles can be cultivated with a little practice and patience, and the habit of falling to sleep immediately on retiring can be easily acquired. Very often a complete change of scene to a hill station or the seaside is beneficial. A glass of hot milk or warm water sipped before going to bed is sometimes effective. The use of sedative or hypnotic drugs should be avoided unless ordered by the physician, as they are habit-forming and harmful to health. They soon lose their hypnotic effect, and larger doses have to be taken to produce a few hours unrefreshing sleep : besides many fatal accidents have occurred from their use. An ounce of the sedative mixture (No. 65 or 87) might be used occasionally, one to two hours before retiring, but it should not be repeated during the night nor continued for long. Any morbid condition responsible for sleeplessness should be remedied.

JAUNDICE (Icterus). In jaundice the bile secreted by the liver is obstructed in its passage to the intestine and gets absorbed into the circulation, staining the skin, conjunctiva and other mucous membranes. The bile is excreted in the urine which is stained with the characteristic yellow colour. This variety of jaundice is known as obstructive jaundice, and the obstruction may be caused by a gall-stone, thick vicid bile or inflamed and swollen mucous membrane of the bile duct. In some diseases of the liver the obstruction is produced in the minute ducts in the substance of the liver, notably in cirrhosis of the liver and a disease known as acute yellow atrophy of the liver, both of which are very serious and fatal. It is known as toxic jaundice when it is caused by certain chemical poisons, such as T. N. T., phosphorus, arsenic, and in certain infectious diseases. It is a prominent feature in epidemic or infectious jaundice (Vol. II). A mild type of jaundice is seen in a large number of new-born infants, which appears on the second day after birth and disappears after a week without any treatment. In some families successive infants are affected by a severe type of jaundice soon after birth, which is usually fatal. Congenital syphilis and septic infection of the wound at the navel when the cord is cut may produce a severe kind of jaundice in the new-born.

The yellow colour of the conjunctiva is first noticed by the friends of the patient. It is also noticeable in the nails and palms. Certain drugs, such as atebrin, mepacrin, etc., stain the skin and conjunctiva yellow when taken internally, but the colour soon disappears after it is stopped. The urine in jaundice shows a greenish yellow colour which can be seen if the glass containing it is held up to the light. In jaundice the bowels are usually constipated and the stools are white on account of the absence of bile and the presence of undigested fat. Itching is felt all over the body except the face ; the pulse is slow, and nausea, loss of appetite, flatulence, a bitter taste in the mouth, headache, lassitude and drowsiness are also present. In jaundice due to serious diseases of the liver there are delirium, stupor and coma before death. Jaundice due to catarrh of the bile ducts disappears under treatment within a fortnight.

Jaundice being a symptom, its treatment depends upon the condition responsible for it. When the obstruction is due to the catarrhal condition of the bile duct dietetic treatment is all that is necessary. Fatty food and unskimmed milk should be avoided and the patient should remain in bed if nausea and fever are present. Nausea can be relieved by abstaining from food for 24 to 36 hours during which nothing but water, which has not been iced, should be taken. After fasting, barley water, skimmed milk, thin toast with very little butter, boiled fish and vegetables might be taken and later eggs, chicken, etc. The normal diet should be restored gradually when the stools resume their normal colour. For persistent nausea and depression chloride of ammonium mixture (No. 54) might be taken thrice daily after meals. Excessive itching is relieved by zinc and boric ointment (No. 120) or carbolized oil rubbed on the part after a hot bath.

LUMBAGO (Backache). Lumbago is an attack of severe pain and stiffness of the muscles of the back which comes on suddenly and incapacitates the person from physical work. Its immediate cause is exposure to cold, especially after a bath or sweating, or a sudden severe muscular effort. It usually attacks middle-aged persons with a rheumatic or gouty tendency, or those who have a septic focus somewhere in the body. In younger persons the muscles of the neck are affected under similar circumstances, and the trouble is known as *wry neck* or *stiff neck.* The neck is pulled and fixed to one side and all movements are very painful. In lumbago any attempt to turn the body to one side, or straighten the back brings on a sudden spasm of pain, but when the patient is at rest there is no pain or discomfort. The attack lasts for a week or may continue for weeks, and has a tendency to recur at irregular intervals.

The treatment for the immediate relief of pain consists in giving rest to the part, applying heat and counter-irritants (No. 36), and massage. The heat is applied by dry fomentation several times a day, by bathing the part with hot water, exposure to radiant heat, for which special electric lamps are available, or by ironing the part with a hot iron, a towel being evenly spread on it to prevent burning. The heat is applied for three minutes to start with, and the time slowly increased to five ; the part should be covered with flannel after applying the heat. The application of strong tincture of iodine or mustard plaster in the beginning of the attack helps to cut it short. A saline purgative, and aspirin powder (No. 135) two or three times a day, are useful in rheumatic subjects. If the pain is constant or very severe, the patient should remain in bed ; it can be relieved by liniment No. 37.

As the trouble has a tendency to recur, it is necessary to have a thorough investigation made in order to find out and remove the underlying cause. Those who had an attack should avoid sudden muscular efforts and exposure to cold or draughts after bathing or sweating.

NIGHT-TERRORS. By night terrors is meant a frightful dream accompanied with a sense of oppression, suffocation and helplessness. It may be an occasional nocturnal disturbance, in which case it is of no particular significance, or it may occur frequently when it is a symptom or precursor of some serious psychological trouble, such as hysteria, insanity, etc. It usually comes on when the patient is sleeping on his back or left side, mostly during the first part of the night within a couple of hours of going to bed. It begins with a weird and terrifying dream ; the sufferer dreams that he is falling from a great height and is in dreadful expectation of coming in violent contact with hard ground, or is being buried under overwhelming rocks, or is pursued by wild animals or robbers and is in imminent peril of his life. He is completely paralysed and horrified on account of his inability to escape from the danger and begins crying, screaming violently or utters indistinct sounds. He might get a minor convulsive seizure during the attack and become unconscious. The attack is followed by violent palpitation and a sense of fatigue. There may be more than one attack during the course of the night. In mild cases the attacks are repeated at long intervals, but in severe ones there may be two or three during the week. Abnormal conditions of the stomach, heart, tonsils or lungs, or the presence of adenoids, or an overloaded stomach act as an exciting cause.

For the successful treatment of this condition a thorough medical examination of the child is necessary in order to find out and remedy any abnormal condition that may be present. A child with a nervous temperament should not be frightened, or told terrifying stories and should not be overburdened with studies. He should have regular open air exercise, light and early meals in the evening, warm and comfortable clothing, and regular hours of turning in. It may be possible from the indistinct mutterings in sleep to recognize the source of the trouble, such as a threat, a terrifying story or some other frightening experience. A single such experience is likely to produce a severe psychic injury, the effect of which might last a long time or for life, and adversely affect the well-being of the child in the future. The practice of frightening children when they are unruly is very undesirable and it is likely to lay the foundation of some serious permanent trouble.

If there is a tendency to bed-wetting it should receive proper treatment. The child should not be scolded or receive any undue sympathy, as it is likely to maintain the symptoms unconsciously so as to retain the care and sympathy of the parents. The child should be tactfully encouraged to talk about his fears and unpleasant experience, and should be explained the unreality of the danger, and this should be frequently impressed on his mind directly and indirectly. Only in case of frequent and severe attacks drugs would be necessary, but their frequent use is undesirable. Bromide mixture (No. 95) might be given for a short time and discontinued when no longer needed.

PAIN. Pain is an important though a very unpleasant symptom in many abnormal conditions of the body, and is often the first sign to draw the attention of the patient to the part of the body where something has gone wrong. The intensity of the pain is not always in direct proportion to the seriousness of the condition, and in many serious cases it may be absent, as in the beginning of cancer of the breast, though towards the end it is such a prominent and distressing symptom. It is useful in locating the trouble, but it may not always be felt at the site of the mischief. The pain of appendicitis in the early stages is not felt in the area of the appendix, but is spread over the abdomen. The pressure of a growth on a nerve causes pain, not at the site of the pressure, but in the area of distribution of the nerve. Similarly any trouble in the spine produces pain in the terminations of the nerve originating from the damaged part of the spine. Pain arising in the liver is usually felt on the right side of the chest and right shoulder ; while that from the heart is felt, not only in the chest, but also in the left shoulder and left arm as far as the elbow or hand. A stone passing from the kidney through the ureter causes pain in the back, scrotum and the inner surface of the thigh. Neuralgic pain from a tooth may be felt all over the face.

Pain in different organs and from different causes varies in nature and severity, and often it is possible to determine the nature of the trouble from the character of the pain. Shooting or stabbing pain at the side and front of the chest is due to pleurisy ; throbbing or bursting pain, with which most of us are familiar, is caused by an abscess ; dull aching pain in the limbs is due to chronic inflammation of bones ; while neuralgic pain is burning, cutting or stabbing.

Susceptibility to pain varies, not only in different races, but in different individuals of the same race. Highly civilized races, that are not exposed to hardships, are, as a rule, more sensitive to pain than uncivilized ones. Highly strung neurotic persons and those brought up in luxury and comfort are more sensitive than those not so favourably placed in life. Neurotic and hysterical persons exaggerate their suffering to draw the sympathy of friends, and it requires some experience to estimate correctly the real intensity of pain suffered by them.

Mental control can reduce or do away with pain altogether. There are many patients who suffer in silence without giving any indication as to the extent of their suffering. Many Arab and African tribes consider it cowardly or shameful to show any signs of pain. Some wandering tribes in India train their children from a very early age to suffer pain in silence and inflict cruel punishments if they cry or complain.

The treatment for the relief of pain consists in remedying the trouble which is responsible for it.

PALPITATION. Palpitation is a rapid and violent action of the heart which is perceptible to the patient. It is a symptom present in many conditions unconnected with any disease or abnormality of the heart, in which case it is called functional and is readily amenable to treatment ; it may be present in some organic diseases of the heart also. The more common causes producing functional palpitation are digestive disturbances, chronic constipation, acidity of the stomach, excessive use of tea, coffee, alcohol or tobacco, emotional disturbance and frequent use of depressant drugs. Neurotic persons and some women at menopause get it from any slight cause. In toxic goitre it is a prominent symptom and is the first to draw the patient's attention to the trouble.

The treatment consists in remedying the cause ; it may continue for some time after it is removed. A nervous patient is very apprehensive about his heart and needs an assurance that there is nothing wrong with his heart and the trouble could be easily got over provided he did not worry about it. Digestive disturbances, constipation or any other ailment require suitable treatment. Neurasthenic and hysterical patients obtain relief from bromide of potassium (No. 65), but this should not be continued too frequently or for long. Moderate exercise in the open air, light diet and other measures for the promotion of health should also be adopted. Palpitation in women at menopause does not require any treatment, unless it is persistent and is accompanied with other troublesome symptoms in which case the administration of ovarian extract is beneficial.

RUMINATION. Rumination or chewing the cud is a normal practice in certain animals and is rarely seen in human beings. It is indulged in by some children and neurotic persons, and is often associated with hysteria, neurasthenia or insanity. It is sometimes hereditary, or acquired in childhood by imitation. In children a sugar-coated quinine pill, given after each meal, is very effective in checking the habit as the contents of the stomach are rendered bitter and unpleasant to taste.

SEA-SICKNESS. It is a very distressing complaint to which certain persons are liable during a voyage when the sea is rough. The liability varies in different persons at different ages and under different circumstances. Many persons are immune to it, as also infants, young men of athletic type and very old persons. Disorders of digestion, constipation, congestion of the liver, pregnancy, diabetes, kidney disease, and a neurotic temperament are strong predisposing causes. Persons suffering from migraine and other allergic troubles are very susceptible to it. Some persons get sick before embarking.

It is produced by the irregular movements of the ship which upset the balancing mechanism located in the internal ear. Nausea is a very prominent symptom and is accompanied with a feeling of heaviness in the head, headache, giddiness, pain in the stomach, vomiting and sleeplessness or drowsiness. Vomiting relieves some of the unpleasant symptoms for the time being, or it may be very troublesome and the vomited matter contain a streak of blood. Persistent vomiting and starvation bring on acidosis, i.e., diminished alkalinity of the blood which aggravates vomiting.

The preventive treatment consists in being prepared for the voyage before embarkation. A mild saline purgative is taken three days before sailing ; and a very light diet during the period, containing plenty of carbohydrates and very little fat. Fruit juice or barley water sweetened with glucose is useful in increasing the carbohydrate contents of the blood. For a short voyage a light diet is taken, not less than four hours before embarking, and two hours after that a capsule containing 10 grains of chloretone, or 15 grains of potassium bromide dissolved in a wineglassful of water. This is repeated on embarkation and, if necessary, after four hours, but no more than three doses are to be taken during 24 hours. For a long voyage chloretone should be taken twice a day only. The patient should remain on the deck and have plenty of fresh air ; in stormy weather, when all portholes are closed, the lounge or a sheltered spot on the deck is the best place for rest. As persistent vomiting and want of nourishment aggravate the trouble it is essential to take a light diet containing carbohydrates, and fruit juice with glucose. When nothing is retained, a small sip of iced barley water with glucose might be taken every few minutes. Bovril is refreshing and is retained when everything else is thrown out. Starvation should be avoided, and small quantities of toast, biscuits, milk, eggs, chicken, fish, rice, and jellies might be taken.

Sulphate of atropine is found to be beneficial in many cases in averting or alleviating the trouble. A hypodermic injection of 1/120th of a grain of it is given an hour or two before embarking and repeated after three hours. During the stormy part of the voyage smaller doses are given twice daily. In its absence an ounce of No. 88 might be taken three times a day by the mouth. Many patent remedies are sold for the relief of sea-sickness, most of which contain chloretone, while others are quite useless if not harmful.

SPITTING OF BLOOD (Haemoptysis). Bleeding from the lungs is a symptom of many abnormal conditions of the lungs, air passages, heart, liver, blood vessels or blood. A common cause of sudden excessive bleeding in apparently healthy young persons is the erosion of a blood vessel due to tuberculosis of the lungs which has hitherto remained symptomless and undetected. After one or more attacks of bleeding, other symptoms of the disease make their appearance. In tuberculosis such sudden and excessive bleeding might take place at any time during the course of the disease. In rare cases it might take place without any apparent cause. In lobar pneumonia slight bleeding might take place in the beginning of the attack, but later on brownish red or "rusty" sputum is expectorated when the disease has fully developed. In cancer of the lungs the blood expectorated resembles red current jelly. In China, Korea, Japan and other eastern countries the infection of the air-passages by a small parasitic worm called *bronchial fluke* causes bleeding.

In heart disease it is due to congestion of the lungs. The bursting of an aneurism into the lungs or the windpipe causes sudden and excessive bleeding which is fatal. In a disease of the blood called *haemorrhagic purpura* and in the early stages of some infectious diseases slight blood is expectorated. Malingerers and hysterical persons sometimes spit a little blood which comes from the mouth or throat from a slight self-inflicted injury.

Every case of bleeding from the lungs requires early attention so as to find out the cause. The patient should be kept in bed until medical help is available. His diet should be low without any stimulants. In the absence of medical help he might be given 30 grains of lactate of calcium in a little water three times a day, and an ice-bag or cold compresses kept on the chest.

SWELLING OF THE FEET. See Dropsy.

TOOTHACHE. The teeth are made up of the enamel, dentine or ivory, and pulp. The enamel is the outer hard shiny layer covering the dentine which forms the bulk of the tooth. It has a cavity which contains the dental pulp made up of minute blood vessels and nerve endings. The pulp is very sensitive to tactile and thermal sensations ; these do not affect it as long as the enamel is intact, but when it is eroded, the pulp is liable to be inflamed and become very painful even when the cavity is not exposed, as dentine is a good conductor of heat. The causes which bring about the decay of teeth are the deficiency of vitamin A in the diet, want of oral hygiene, excessive acidity of the stomach and injury to the enamel. A soft brush should be used after every meal for cleaning the teeth and all particles of food lodged in the crevices between them removed by circular movements. A hard brush and undue force are harmful to the enamel, and cause recession of the gums and pyorrhoea. If a toothpick has to be used, a clean wooden or non-metal one should be used. A dentist should be periodically consulted even if there is nothing apparently wrong with the teeth.

Toothache can be temporarily stopped by plugging the cavity, if one is present, with a small plaget of cotton-wool soaked in creosote, oil of cloves, or carbolic acid, which is kept in it for some time. The plaget should be just large enough to fill the cavity, and the fluid should not be allowed to touch the mucous membrane as it burns and blisters. Aspirin powder (No. 135) taken internally is useful in relieving the pain temporarily. As the cavity has a tendency to increase in size if left alone, a dentist should be consulted at an early date.

TREMORS. By tremors is meant an involuntary trembling of a limb or muscles. It is a symptom associated with various conditions in health and disease. It may be continuous, intermittent, or associated with voluntary movements. Many nervous persons in good health suffer from it. In old persons it affects the head and upper extremities and is of no special significance. Hysterical persons when under observation get it. It is a common symptom of chronic alcoholism and metalic poisoning. In some chronic diseases of the nervous system, especially in *shaking palsy* (paralysis agitans), and a chronic disease of the spinal cord known as *disseminated sclerosis*, it is a very troublesome symptom. In *chorea* (St. Vitus' dance) the patient gets irregular and involuntary jerks which are more or less constantly present and get worse when the patient is under observation ; but they stop during sleep except in severe cases. Every case of tremors requires treatment suitable for the condition responsible for it.

THE URINE. Urine is the secretion of the kidneys containing the waste products of the body in solution. A routine examination of it in every case of abnormal condition of health is necessary, as it gives an indication, not only as to the state of the kidneys, their efficiency as excretory organs, and the condition of the urinary tract, but also shows some abnormal conditions of the body that might be present. As the solid contents of the urine vary considerably in the course of the day, it is necessary for quantitative analysis to collect the total quantity passed during 24 hours, commencing from 8 a.m. ; that passed till 8 a.m. is rejected, but after that all that is passed for 24 hours is collected in a clean bottle. A few drops of chloroform or a few crystals of thymol are added to prevent decomposition of its solid contents. For bacteriological examination a fresh sample has to be sent in a sterilized bottle as required by the pathologist.

In health, between 40 and 50 ounces of urine are passed in 24 hours, but the quantity varies under different conditions. It is increased in cold weather or after taking large draughts of water or some articles of food. It is diminished in hot weather, after sweating, severe vomiting or diarrhoea, in failing circulation, fever, cholera, and acute inflammation of the kidneys. In diabetes, chronic inflammation of the kidneys, and some brain diseases it may be increased to four or five times the normal quantity. When the secretion completely stops, as in severe acute inflammation of the kidneys, cholera, etc., the condition is known as *anuria* or *suppression of urine*, and unless it is re-established soon death takes place from uraemia, i.e., poisoning from the accumulated waste products in the blood. When the urine is secreted and accumulates in the bladder, but can not be evacuated on account of an obstruction in the urethra or paralysis of the bladder, the condition is called *retention of urine*, and unless it is relieved in time, it is likely to cause a rupture of the urethra above the site of obstruction ; the urine is forced into the soft tissues causing extensive ulcers, or gangrene, and this condition is known as *extravasation of urine*.

Fresh urine in health has a characteristic odour which becomes very unpleasant from decomposition after a time. Many articles of diet and drugs impart their odour to it. Diabetic urine has a peculiar sweetish smell, which when acetone is present in it, becomes fruity. In chronic inflammation of the bladder it develops an ammoniacal or fishy odour which is very unpleasant.

The normal urine is usually pale brownish yellow or straw coloured, but the colour depends on the concentration and the presence of drugs or other abnormal substances taken internally, or on the presence of blood, pus, chyle, etc. It is smoky when a small quantity of blood or blood pigment is present, red when the quantity of blood is large, green or yellowish green with bile, and milky white when chyle is present in it (see chyluria). A large quantity of phosphates, when the urine is decomposed in the bladder or sometimes in children, makes it greyish white, and in a malignant disease called melanotic sarcoma it turns dark or black on standing.

The reaction of the normal urine is acid. The reaction of a liquid is determined by means of blue or red litmus paper, the former turns red when brought in contact with acid, and the latter turns blue when the liquid is alkaline. The reaction is to be taken when the urine is fresh, because the liberation of ammonia in stale urine makes it alkaline. The administration of certain drugs and mineral acids, fasting, physical exertion, fever, rheumatism, gout, and diabetes increase the acidity, while salts of sodium, potassium and lithium diminish it. In chronic inflammation of the bladder it becomes alkaline from decomposition in the bladder.

The specific gravity of urine in health varies between 1015 and 1025 and depends on the quantity of solids in it. The specific gravity of a fluid means the weight of a certain volume of it compared with that of the same volume of distilled water at 4° C. The instrument used for taking the specific gravity of urine is called urinometer. It consists of a narrow stem of glass with a graduated scale, attached to a bulb filled with mercury. When floated in distilled water the zero mark on the stem is on a level with the surface of water, which means that the specific gravity is 1000. It is low in diabetes insipidus, chronic kidney disease, during hysterical paroxysms, in old age, and after taking a large draught of water. It is raised after a prolonged fast, heavy meal, physical exertion, abstinence from liquids, in diabetes mellitus, diarrhoea, vomiting, fever, acute kidney disease, etc. A constant high specific gravity with a copious flow of urine should raise a suspicion of diabetes mellitus.

The solid constituents of normal urine are urea, uric acid, mostly as urates, other nitrogenous substances, chlorides, phosphates and oxalates. The quantity of these varies in health and disease, and depends on the amount and kind of food taken. The abnormal substances that might be present are albumin, sugar, acetone, diacetic acid, chyle, blood, pus, bile and gravel. A small trace of albumin in the urine of young healthy persons after exercise is of no special significance. It can be detected by a simple test, for which a test tube and a spirit lamp are required. The test tube is filled with freshly passed urine to within two inches of the top, and the upper inch of the urine is heated over the flame. To prevent the urine from bubbling over, the tube should be moved in and out of the flame. If albumin is present a white cloud is formed on the top where the urine is boiled. The density of the cloud gives a rough indication as to the amount of albumin present. If the urine is alkaline a white cloud is formed by phosphates, which disappears on adding a few drops of acetic acid. Some drugs also produce a similar cloud when present in the urine.

A small trace of sugar may be found temporarily in health after a meal of carbohydrates, but in diabetes it is constantly present in varying quantities and raises the specific gravity of urine. It can be readily detected and its quantity fairly accurately estimated by chemical analysis. Before testing for sugar any albumin that may be present has to be removed by boiling the urine and filtering it through filter paper. Of the several tests for sugar, the two known as Fehling's and Benedict's respectively are easy to perform. About an inch of the test tube is filled with Benedict's solution which is slowly boiled over a spirit lamp, and while it is boiling the urine is run into it drop by drop with a glass pippet. If sugar is absent no change takes place, but if it is present, a brick-red precipitate is formed, the density and colour of which are in direct proportion to the amount of sugar present. Fehling's solution is available in two parts, and each is kept separate until required for use. An equal quantity of each is mixed in a test tube and treated as above. In addition to sugar, acetone, diacetic acid and oxybutyric acid are found in diabetic urine, their quantity increases considerably when the patient's condition deteriorates and coma threatens to supervene. They impart a fruity odour to the patient's breath and sweat.

Blood in the urine (haematuria) is found in many abnormal conditions of the different parts of the urinary system. When from the bladder it is mixed with urine and some of it comes at the end of micturition ; when from the urethra, it precedes the urine, or is independent of micturition ; and when from the kidneys it is mixed with the urine. It may be due to an injury to the kidney or an acute inflammation of the organ, an injury to any other part of the urinary system, the presence of parasites (see bilharziasis), tumour, cancer, urinary stone, or certain irritant drugs taken internally. The presence of blood or blood pigment in the urine is easily detected by chemical or microscopic tests.

Pus in the urine (pyuria) occurs in suppuration in any part of the urinary system. When derived from the bladder, the urine is alkaline. It forms a greyish or cream coloured deposit on standing when a large quantity of it is present. It is detected by chemical or microscopic tests. Bile is found in urine in jaundice and can be seen if a small quantity of urine is vigorously shaken up in a test tube when the foam that is formed on the top is of a yellowish green colour. Sand or gravel may be present without producing any symptoms. It is found as a reddish brown or brick-red deposit and is due to the precipitation of urates and oxalates. Larger particles while passing down the ureter produce renal colic. In chyluria the urine is milky white on account of the presence of chyle in it which comes from the bursting of the obstructed lymph vessels. This occurs in filariasis (q.v.).

VOMITING (Emesis). Vomiting is a symptom of some disturbance of the digestive system or of some general disease unconnected with it. The conditions in which it occurs are : (1) Diseases of the stomach, such as acute inflammation, ulcer, cancer, etc. (2) Corrosive or irritant poisons or emetic drugs. (3) An obstruction at the outlet of the stomach occuring in chronic ulcer or cancer, or in infants due to a congenital stricture. (4) Toxic conditions as in uraemia and some infectious diseases. (5) Hysteria and other neurotic conditions. (6) Periodic or cyclic vomiting of children, which occurs every few days or weeks and which is a serious condition. (7) Severe fits of coughing as in whooping cough. (8) Mechanical irritation of the throat which is often resorted to for emptying an overloaded stomach or for malingering. (9) Sea-sickness or any other kind of disturbance of the balancing mechanism in the internal ears known as semicircular canals. (10) Intestinal obstruction (Vol. II). (11) Increase of the intracranial pressure from any cause. (12) Pregnancy, especially the first one, during the period between the second and the fourth month. It is more marked in the morning and is therefore known as the *morning sickness of pregnancy*. (13) The displacement of any abdominal organ. (14) Any acute inflammatory condition in the abdomen. (15) Migraine, a severe kind of headache due to allergy, in which vomiting takes place towards the end of the attack, and the headache is relieved as soon as the contents of the stomach are emptied. (16) A disease of the nervous system called *locomotor ataxy*, in which paroxysmal attacks of vomiting associated with severe abdominal pain occur at irregular intervals.

As vomiting is a symptom, the treatment is directed towards the relief of the condition responsible for it. Many of these, especially inflammation, obstruction, poisoning, etc., are very serious and require prompt professional attention. In case of poisoning, vomiting should not be stopped until all the contents of the stomach are evacuated. In all cases the stomach should be given sufficient rest and all food withheld for 24 hours or longer if necessary, and only iced water given by the mouth in small quantities at a time, every twenty minutes. Iced barley water sweetened with glucose might be given when vomiting has stopped, and later milk and other liquids might be added. In persistent vomiting there is a risk of the body being dehydrated on account of the loss of fluid, so if nothing is retained and vomiting continues, saline and nutrient enemata (Nos. 15 and 16) should be given.

VOMITING OF BLOOD (Haematemesis). Vomiting of blood may be due to causes connected with the stomach, such as inflammation, ulcer, cancer, corrosive poisoning, or an injury of the organ, etc., or they may be independent of any condition of the stomach. It is a fairly common feature of some acute infectious diseases, particularly yellow fever, haemorrhagic variety of small-pox, severe malaria, haemophilia, haemorrhagic purpura, and advanced anaemia. In chronic liver or heart disease it is due to the congestion of the blood vessels in the stomach. In some rare cases in women suffering from amenorrhoea, i.e., abnormal suppression or absence of menstruation, vicarious bleeding takes place from the stomach, but it is not much. Hysterical patients and malingerers sometimes produce a small quantity of blood in the vomited matter from a self-inflicted wound in the mouth or throat. It sometimes occurs in the new-born without any apparent cause and may be so severe as to endanger life.

The vomited blood may not be from the stomach but from the throat or air-passages, which has been swallowed. The quantity of blood vomited varies and depends on the condition responsible for it. There may be a streak or two or so little as to require a chemical examination for its detection, or large quantities of bright red blood brought up at short intervals. Such excessive bleeding comes from an eroded vessel in the stomach or from an aneurism which has burst into it which is rapidly fatal.

In case of bleeding from the stomach from any cause complete rest is necessary. The patient should, therefore, be put to bed immediately and not allowed to get up on any account. The stomach also requires rest, therefore no food should be given except sips of cold water as long as bleeding continues. Ice-bag or cold compresses are applied over the stomach area and the patient given pieces of ice to suck, and liquid nourishment given per rectum. No stimulant should be given. An ounce of opium and bismuth mixture No. 64 might be given and repeated after three hours if necessary, in the absence of medical help, but no more than three doses should be given during 24 hours. Blood transfusion is given if the patient shows signs of collapse, but the benefit derived from it is temporary if the bleeding has not stopped.

CHAPTER 4

VITAMINS AND DEFICIENCY DISEASES

Vitamins are complex chemical substances present in very minute quantities in human food, which play a very important part in nutrition and maintenance of health and vigour of the body. Their continued absence from food causes certain abnormal conditions which are known as deficiency diseases or *avitaminosis*. Many minor disturbances of health, such as loss of appetite, want of physical and mental energy, lowered resistance to infection, night-blindness, etc., also result from their deficiency in food. Some of these are synthetically produced in the laboratory. The exact manner in which they play such an important part in the body is not yet properly understood, but they stimulate the tissues and enable them to assimilate food. Avitaminosis also results if, for any reason, though present in food they are not absorbed, as in chronic diseases of the alimentary tract, or if the intake is not increased when there is an extra demand for them, as in pregnancy. In prolonged diseases, particularly typhoid fever, in which food is restricted, there is a real danger to the patient from avitaminosis which adversely affects his chances of recovery. Under such circumstances the diet should be so arranged as to contain all vitamins in sufficient quantity.

Many vitamins have been recognized but about nine of them are found to be necessary for human beings, while others are necessary for birds and animals. Although their chemical composition is known they are usually called after the letters of the alphabet. Four of them are soluble in fat, the others being soluble in water. The following table shows at a glance their sources, effects produced on the body by their deficiency and their stability under different conditions. They are present in many other articles but only a few rich sources are given here.

(1) **FAT SOLUBLE.**

Vitamin.	Sources.	Results of deprivation.	Stability.
A	Fish liver oils, butter, cream, milk, green vegetables, eggs, liver, carrots, etc.	Impaired nutrition, poor growth in children, lowered resistance to infection, dry rough skin, dry conjunctiva, softening of the cornea, defective formation and caries of the teeth.	Not destroyed by ordinary heat in cooking or canning but is destroyed if heated in the presence of air.
D	Animal fats, fish oils ..	Rickets in children, softening of the bones in grown up persons, delayed dentition and caries of the teeth in grown up persons.	Not destroyed by heat or oxidation or by canning.
E	Cereals, green vegetables.	Sterility in the male, frequent abortions in the female and the death of the foetus during gestation.	Resistant to heat and not destroyed in cooking but destroyed by alkalis.
K	Green vegetables, animal liver, soya bean oil, alfa grass.	Tendency to bleed under the skin and muscles.	Not destroyed in cooking.

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(2) **WATER SOLUBLE.**

Vitamin.	Sources.	Results of deprivation.	Stability.
B1	Unpolished rice, oatmeal, peas and lentils, soya bean, rice polishings, wheat bran, eggs, brewer's yeast, fresh milk and tomatoes.	Multiple neuritis, beriberi, weakness of the heart muscle, palpitation, disordered digestion, defective development and growth in children and deficient mental activity.	Not destroyed by cooking or canning. Destroyed by alkalis.
B2	The same as B1 . .	Loss of appetite, digestive disturbances, inflammation of the tongue, defective nutrition and dimness of vision.	Not destroyed by heat.
B6	Liver, kidneys, meat, eggs, milk, cheese, and green vegetables.	Sleeplessness, irritability, physical and mental weakness, skin eruptions and pellagra.	Not destroyed by heat in cooking or canning.
B12	Animal liver	It is a preventive against a severe type of anaemia known as pernicious anaemia.	. . . .
C	Green vegetables, oranges, lemons and other citrus fruits, tomatoes, germinating cereals and pulses.	Tendency to bleed from the gums and mucous membranes, dyspepsia, muscular weakness, defective nutrition, lowered resistance to infection, retarded growth in children, defective teeth formation and scurvy.	Readily destroyed in cooking or canning and by keeping even in refrigerator. Not destroyed in properly preserved citrus juice.

Many other abnormal conditions of health in human beings are very probably due to the absence of vitamins in the diet. Some of the important diseases due to vitamin deficiency are described here.

BERIBERI. It is caused by the continuous absence or deficiency of vitamin B1 in the diet. It is characterised by multiple neuritis, weakness of the heart, and dropsy. The disease is prevalent in an endemic form in those countries where rice is the staple article of diet and where other articles containing the vitamin are not included in the dietary. It was at one time very common in China, Japan, Malaya, East Indies, Burma, and parts of India where polished rice was used. The disease is very amenable to treatment and disappears as soon as the necessary vitamin is administered.

Its onset is slow and progress gradual, but sometimes it develops suddenly and soon terminates fatally. It takes two or three months to appear after the necessary vitamin has been absent from food. There are three types of the disease, (1) Dry beriberi with neuritis and little swelling of the limbs, (2) Wet beriberi with dropsy and weak heart, and (3) Acute or fulminating beriberi in which death takes place at an early date from heart trouble.

The symptoms are a feeling of fatigue, weakness and heaviness in the legs, palpitation, shortness of breath on slight exertion and digestive disturbances followed by wasting, unsteady gait and diminution or loss of sensation in the skin. In the wet variety there is swelling of the limbs with puffiness of the face. Acute and fulminating cases make rapid progress and do not respond to treatment.

The treatment consists in prescribing food that is rich in the necessary vitamin. The food should include unpolished rice, oatmeal, barley, peas, bran, and eggs. Yeast and many of its preparations available in the market under different trade names are rich in this vitamin and are used. Rest in bed is very essential as many apparently mild cases die from heart failure. For weakness of the heart four minims of a solution of strychnine with seven mimims of tincture of digitalis in an ounce of water are given thrice daily. In India, toddy, i.e., the juice tapped from the date palm is a cheap, efficient and rapid cure and a preventive against the disease, being rich in fresh yeast in addition to anti-scurvy vitamin C, sugar and organic salts of sodium and potassium, which are very essential for the maintenance of good health, especially for hard working poorer classes whose diet is deficient in these elements. They unwittingly protect themselves against beriberi by indulging in this least harmful drink. What little yeast that is present in toddy before fermentation is readily destroyed by doping the liquid with slaked lime, chloroform, or other dopes.

SCURVY. Scurvy is produced by the prolonged absence of the anti-scurvy factor or vitamin C in food. The vitamin is present in fresh fruits, vegetables, milk, meat, etc. It is destroyed by prolonged heating, canning, drying or by an alkali. The disease was at one time very prevalent among troops, prisoners, asylum inmates, and on ships during long voyages ; but now it is mostly confined to the poorer classes and cold countries during winter months when there is a scarcity of green vegetables. In India it is fairly common among the labouring classes, most of whom show signs of the disease in different degrees of severity.

Its onset is insiduous and in the adults one of the earliest signs is the sallow muddy colour of the skin. The patient loses weight and strength, gets easily tired and out of breath and has pains in the muscles and joints of the legs. The early symptoms are mild and are liable to be mistaken for rheumatism. Later the gums become soft, tender, swollen, and bleed readily, there is an offensive smell from the mouth, the skin becomes rough and dry and shows minute dark points where bleeding has taken place; there may be large patches of such bleeding under the skin. Bleeding also takes place in the muscles so that the limbs become stiff and painful. All wounds and injuries bleed freely and get readily infected with septic micro-organisms. The condition ends in death if not treated in time.

In infants, who are bottle-fed and whose diet does not contain anti-scurvy vitamin, scurvy is fairly common, running a rapid course and ending fatally. In them the swelling of the gums is absent if the teeth have not erupted. The infant may look fairly well nourished but is pale and anaemic, peevish and irritable, constantly cries, has poor appetite and refuses the bottle.

The disease is very amenable to treatment and if taken in hand

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early complete recovery takes place without leaving any permanent damage. The treatment is chiefly dietetic and the effect produced is magical, as within a very short time the patient's condition shows a decided improvement. The diet should contain fresh vegetables, fruit, orange or lemon juice, etc. Advanced cases should remain in bed so as to prevent any strain on the heart. The mouth should be frequently washed with a mild antiseptic fluid and the gums touched with one per cent nitrate of silver solution in distilled water twice daily or with a solution of perchloride of iron (No. 31).

By way of prevention the diet should contain a sufficient quantity of fresh vegetables, fruit, milk, etc. As the vitamin is destroyed by prolonged heat, drying, or an alkali salt, fresh vegetables should be used and soda or any other alkali should not be used in cooking, and as the vitamin is soluble in water, the water in which vegetables are boiled should not be thrown away but used in gravy or other food. Bottle-fed children should be given fresh fruit juice, etc.

PELLAGRA. This disease is caused by the prolonged absence of vitamin B6 which is a pellagra-preventive factor. The disease is found in southern European countries, Spain, Portugal, Italy, Africa, India, Malaya, China, Japan, and parts of South America. It is mostly confined to the poorer classes. It is a chronic disease with slow onset and a long irregular course. The early symptoms are digestive disturbances, loss of appetite, headache, mental depression, irritability, giddiness, sleeplessness, and pain in the back and joints. These may continue with a varying degree of severity for years without any other trouble and the disease may not be recognized. The characteristic skin eruption appears some time after the appearance of these initial symptoms on both the hands and other exposed parts of the body and resembles ordinary sunburn. The affected skin becomes thick and is the seat of itching and burning, more particularly the palms and soles. Desquamation takes place and small thin shreds are shed or vesicles form, containing thin dark fluid. The skin cracks and the fissures are painful and slow to heal.

The two chief symptoms affecting the alimentary canal are, the inflammation of the mucous membrane of the tongue and the mouth and diarrhoea. The tongue is red, raw and covered with ulcers. Excessive salivation and soreness at the angles of the mouth are present. The diarrhoea may be continuous or intermittent. In advanced cases there may be mental confusion, hallucinations, serious impairment of the mental faculties and a tendency to suicide. These symptoms, after persisting for some months, abate or disappear for a time, but recur for several years in the spring, ultimately rendering the patient bed-ridden. He dies of exhaustion or some intercurrent disease.

The treatment is naturally dietetic and the patient is given a diet containing the pellagra-preventive vitamin which is present in fresh milk, eggs, fresh meat, fish, whole cereals, and yeast. Fresh toddy is rich in this vitamin and toddy drinkers do not suffer from this disease. Chemically the vitamin is known as nicotinic acid which is used hypodermically with great benefit. In chronic cases arsenic (No. 59) is beneficial.

RICKETS. Rickets is a chronic disorder of nutrition occuring in infants and young children, usually between the ages of six and eighteen months, belonging to poorer classes in large industrial towns, though not altogether absent from better class children. It is prevalent with great severity in cold countries but is mild in the tropics. Infants born prematurely and bottle-fed babies are very liable to get it. It is due to lack of fat-soluble vitamin D which is present in animal fat, especially fish oils. Sunlight or ultra-violet rays play an important part in the prevention of the disease. These rays, by their action on the skin, produce in the body this vitamin which is necessary for the nutrition of the bones.

The onset of the disease is gradual and the early symptoms mild so that it is not suspected until fully developed. The child has a tendency to suffer from diarrhoea and the stools are offensive. The early symptoms are free sweating, especially on the head, restlessness, irritability and peevishness. The child cries when handled and throws off the bed-clothes even when it is cold. A very characteristic sign of the disease is the rounded enlargement of the front ends of the ribs at their junction with the cartilages. These enlarged nodules on each side of the breast bone form, as it were, a rosary of beads which is known as the *rachitic rosary*. The chest shows another characteristic deformity known as the *pigeon-chest* in which the breast bone projects in front and the ribs on each side of it are drawn in. The bones of the legs become soft and bend under the body weight producing bow-legs or knock-knees. For the same reason the size and the shape of the pelvic cavity is altered which causes in the female in later life a very serious trouble during parturition. The head is enlarged and square in shape, and in infants the gaps between the skull bones on the top (fontanels) take a long time to close and can be easily felt. Teething is delayed and troublesome. The limbs are thin and the abdomen enlarged and prominent and on account of the bending of bones and defective growth the body is stunted. Rickety infants are subject to convulsions, tetany, painful muscular spasms, and diseases of the respiratory system. Rickets is not dangerous to life but the intercurrent pulmonary and bowel troubles often prove fatal. The bony deformities, once they are established, remain for life, but bow-legs and knock-knees can be rectified to some extent by surgical treatment.

As the disease is caused by the absence of the antirachitic vitamin in the diet, the treatment consists in supplying this in sufficient quantity. Fish liver oils in suitable doses and a diet containing fresh milk, eggs, etc., are indicated ; mother's milk if insufficient or unsuitable should be supplemented or substituted by one of the many infants' foods containing the vitamin. Exposure to direct rays of the sun is very beneficial, not only as a remedy but as a preventive also. The midday sun should be avoided and the body of the child exposed for a few minutes only morning and evening, care being taken to protect the eyes from the direct rays of the sun. The child need not be stripped completely as the exposure of the limbs and face is sufficient. Artificially produced ultra-violet rays are also beneficial and are used in the treatment of rickets. The child should be kept outdoors as much as possible though not exposed to the sun for prolonged periods. Phosphate of iron and calcium are beneficial in early cases (No. 102) and are given with the above treatment.

Chapter 5

ALLERGY AND DISEASES PRODUCED BY IT

Allergy is a state of hypersensitiveness or exaggerated susceptibility in certain individuals to various substances that produce a severe reaction in them, while to ordinary persons they are quite harmless. The reaction might be manifest after ingestion, inhalation, contact with the skin, or injection. This condition is mostly inherited, but the hypersensitiveness is not confined to the same substance, nor does it produce the same kind of reaction in different members of the same family. Many children get allergic reaction from certain foods and have a natural dislike for them. Allergy may be permanent and may last for life, especially if the offending substance is an inhalant, but in case of an article of diet it may disappear if it is avoided for five to seven years.

The articles of diet which commonly produce the reaction in susceptible persons are, fish, shell-fish, eggs, cheese, meat, milk, cereals, fruits, essential oils and vegetables. Of the inhalants the most common are the pollen of grass or flowers, smell of certain animals, such as the cat, dog or horse and feathers. The reactions produced by these vary considerably and consist of gastro-intestinal disturbance, respiratory trouble, skin eruption, migraine which is a severe variety of headache, etc. Even epilepsy is suspected to be due to allergy, as other allergic reactions are found in some relatives of the epileptic. One kind of allergic condition commonly found in medical practice is produced by the injection of serum as a curative or prophylactic measure, which, in very rare cases, is so severe as to cause death in a short time. In many neurotic allergic subjects auto-suggestion plays an important part in bringing on the attack even though the causative factor is absent at the time. A patient ordinarily suffering from asthma in a particular locality or under certain conditions is likely to get an attack if he visits the locality or is placed under similar conditions, even when the real exciting cause is absent.

Theoretically the ideal method of treatment would be to find out the cause and remove it, but in practice this is not always possible. An intelligent patient may, with a little observation, be able to detect the specific substance. The method employed in medical practice to detect it is known as the skin test which consists in injecting into the superficial layers of the skin proteins prepared from various substances. The allergic substance produces, within a few seconds, a strong local reaction in the shape of itching, burning and a wheal. The same result is also obtained by rubbing the substance on a scratch on the skin. In some few cases the allergic substance does not produce the reaction on the skin, while in others the substance is so uncommon that it is not suspected. Moreover, having found it, it may not always be possible to avoid it ; this is especially the case if it is an inhalant, such as certain scents, pollen of grass which is so universal at certain seasons of the year, or of flowers, especially if one's neighbour on the windward side is fond of that particular flower. The spores of fungi are also universally present in the atmosphere. Feather pillows, eider-down quilts, horsehair mattresses and other stuffing materials for cushions should also be remembered as a possible cause. The dietary factors may also be difficult to avoid.

In the absence of the skin test it is possible in many cases to find the dietary factor by what is known as elimination diets. For the first three days the patient takes only one or two items of food, such as rice, milk, etc., and if no reaction appears during the three days, other items are added one by one every three days until the allergic reaction is produced. To make quite sure the experiment should be repeated two or three times with the suspected item.

DISEASES DUE TO ALLERGY

ASTHMA. Asthma is a fairly common trouble and there are few people who have not seen cases of this very distressing complaint. It is a chronic disease which comes on in frequent paroxysms with varying intervals of good health between the attacks. It is one of the diseases due to allergy to some inhalant or some article of diet. It is also due to the presence of adenoids in the nose and throat or some septic condition in these parts. An inherited tendency to allergy is present in such patients and other members of the family often suffer from some other reactions, such as urticaria, eczema, migraine, or gastro-intestinal disturbances. An attack may be precipitated by indiscretion in diet, constipation, etc. The pollen of grass or certain flowers, scents or orris root commonly present in many toilet preparations, emanations from the cat, dog, horse, or other animal, dust containing finely divided animal or vegetable matter, or spores of fungi, are the inhalants responsible for it. The presence of a dog or cat in the room, vicinity of a horse, the use of feather pillows or horse-hair mattress will bring on an attack in a susceptible person. Dietary factors usually produce urticaria, migraine or gastro-intestinal trouble, but may produce asthma also. The most common articles of diet, which are likely to produce the trouble, are eggs, fish, meat, pork, cheese, vegetables and some fruits, as also some flavouring agents or essences. Asthma is more prevalent during the first decade of life as about 33% of the cases occur under the age of ten.

The paroxysm comes on quite suddenly, but in some cases it is preceded by certain premonitary symptoms, such as running from the nose, sneezing, or a feeling of burning and discomfort in the chest. In children, it commences like a cold or an attack of acute bronchitis with sore throat, cough and fever which are followed within twenty-four or forty-eight hours by difficulty of breathing with the typical wheezy sound. In adults, the paroxysm usually comes on late at night or early in the morning. The patient wakes up with a feeling of suffocation and finds great difficulty in breathing, especially in expelling air from the lungs, without any cough or fever. This continues for some hours before the attack subsides when the patient is free from all symptoms and feels quite well until the next paroxysm or in some cases symptoms of bronchitis continue for some days.

The duration of the attack, its severity, and the interval of freedom vary in different cases or in the same case from time to time and depend on the presence or absence of the exciting cause. In many cases the attacks come on during a particular season of the year ; some are affected during the cold or wet weather only, while others are free during these months, some are benefitted by the humid atmosphere of the seaside, while others are attacked as soon as they come near the sea; similarly some thrive in the close smoky atmosphere of large cities and get the attack in the clear open air of the country. The interval between the attacks varies in different patients and in the same patient at different times. In some they come on regularly every night for a few days and then subside for some days or weeks, while others have them at irregular intervals.

Except in very young children the diagnosis of asthma is very easy. The characteristic features are a sudden attack late at night or early in the morning, with the peculiar wheezy noise which can be heard from a distance, absence of fever, rapid disappearance of symptoms and complete freedom during the interval. But the difficulty lies in finding the specific substance which is responsible for it. An intelligent patient with a little observation may be able to detect the offensive substance or the skin test might provide the clue, but in many cases in spite of observation and tests the cause is not found. Many patients suffering from asthma live to a good old age and are able to carry on their work without much difficulty. The chances of recovery or freedom from attacks are good in those cases in whom the specific cause can be determined. Many asthmatic children improve when they grow up and in women the attacks cease at menopause. The prognosis is not good in patients who are sensitive to many substances and in those who get frequent attacks of long duration.

The treatment of asthma resolves into two parts, viz., the immediate relief, which is usually a simple matter, and the detection and removal of the cause. The latter is a specialised subject and can only be undertaken by a specialist. An attack can be controlled by a hypodermic injection of 5 to 10 minims of adrenalin chloride (1 in 1000). Small glass capsules containing the solution are available which is injected hypodermically under proper surgical precautions. (See hypodermic injection) The relief afforded is immediate and lasts from a few minutes to some hours. The injection may be repeated if necessary after half to one hour. Another drug which produces the same effect is ephedrine, which may be administered by the mouth in tablet form, or by hypodermic injection, the dose being ¼ to 1 grain according to the age and physical condition of the patient. Many patent sprays advertised for the treatment of asthma contain adrenalin or some other antispasmodic drugs which afford temporary relief, though they are guaranteed to cure. Inhaling the smoke of stramonium leaves relieves the spasm and it is the chief ingredient of powders or cigarettes sold for asthma. Frequent use of these is very harmful. If the attacks are very frequent and the free intervals short the patient should be removed to new surroundings and kept in a well ventilated room free from dust.

In every case of asthma it is very necessary to attend to all intrinsic causes, such as adenoids, septic condition of the nose, throat or tonsils, etc., for which a specialist should be consulted without delay. Exposure to cold and dust should be avoided as also late and heavy meals, excess of alcohol, and constipation. The oral administration of certain drugs has been found to be beneficial in reducing the frequency and mitigating the severity of the attacks. For this purpose iodide of potassium with anti-spasmodic drugs is given three times a day (No. 57). If the attacks come on during the early hours of the morning the first dose should be taken at 3 or 4 p.m. and repeated every three hours until bedtime.

HAY FEVER. Hay fever is the reaction produced in certain individuals by the pollen of some grass or flowers which floats in the atmosphere during certain seasons, hence its seasonal prevalence. Most of the patients have inherited an allergic constitution, but the sensitiveness in different members of the family is not confined to the same substance. An allergic person may be sensitive to more than one flower and may, in consequence, suffer during different seasons.

The attack comes on suddently after the exposure to the specific pollen. The symptoms are mostly local and are referred to the mucous membrane of the eyes, nose and throat. The severity of the attack varies in different individuals according to the degree of sensitiveness. To start with there is some burning and itching of the eyes and nose, this is soon aggravated and is accompanied with redness and swelling of the mucous membrane of the nose which interferes with nasal breathing. Paroxysms of sneezing and photophobia, i.e., intolerance of light are also present. The itching is also felt in the skin of the nose, in the palate and throat. The patient feels feverish and very uncomfortable, but the fever is not high. The attack continues as long as there is exposure to the pollen, after which it subsides rapidly and the patient may not get another attack till the same time next year ; but if he is allergic to some other pollen, which is often the case, he may be attacked more than once during the course of the year.

The general health is not affected unless the attacks are very severe and very frequent during the year. In children such attacks may cause permanent swelling of the nasal mucous membrane necessitating breathing by the mouth, septic condition of the throat and tonsils, stunted growth, and mental dullness.

If possible, the patient should leave the locality during the season, but it may not be possible to do so if the allergy is for a multiple of substances and the trouble recurs frequently during the year. The ideal treatment would be to desensitize the patient to the specific pollen, which could be undertaken by a specialist who should be consulted before any permanent complications have set in.

During an attack relief from the distressing symptoms is obtained by the oral administration of ephedrine in ½ to 1 grain doses twice daily. The drug may be given hypodermically in combination with adrenalin solution for quicker results. Ampules containing suitable doses of these, sterilized and ready for injection, are available. Goggles with shields may be worn to prevent the pollen getting into the eyes and as a protection against photophobia. Many proprietory preparations containing adrenalin, ephedrine, menthol, eucalyptol, etc., are available in the shape of ointments or sprays which give temporary relief.

MIGRAINE (Paroxysmal or Sick Headache). Migraine is the name given to periodic attacks of severe headache accompanied with nausea, vomiting and some visual disturbance caused by allergy for certain food actors. As long as the patient avoids these he remains free from the trouble. Like other allergic manifestations heredity plays an important part and it occurs with great frequency in members of families who show this or other reactions. The age of onset, in a large number of cases, is within the first decade of life, while it is rare after the fourth decade.

The attack is usually preceded by some visual disturbance, such as flashes of light or spots before the eyes, or scintillating zigzag lights and confusion of letters. The patient is unable to read and feels tired physically and mentally. This condition may last for a few minutes or a couple of hours before the headache sets in. It is at first dull and confined to one side of the head or may be located in front between the eyes or in the back of the head. It soon increases in intensity, becomes agonizing and unbearable and incapacitates him from doing any work. It is aggravated by movement, loud noise, bright light, food, alcohol or smoking. The duration of an attack varies from a few hours in milder cases to a week or so in very severe ones. Vomiting takes place some time after the headache is fully developed which relieves the patient, but he remains tired and exhausted for some hours. The attacks recur for years at varying intervals. In women they stop after the menopause. There is no danger to life from the attacks, but they continue to recur for years and make life miserable.

As in other allergic conditions attempts should be made to find out the offending substance by personal observation, eliminating diet or the skin test, and to avoid it. It should be remembered that there may be more than one such substance responsible for the complaint. The administration of drugs by the mouth during an attack is of no use, as these do not get absorbed from the stomach as long as the attack lasts ; but the administration of sedative drugs such as aspirin, phenacetin, etc., in the early stage before the headache is fully developed, may reduce its severity and duration. Morphia, codeine, and other powerful drugs should be avoided as much as possible as they are habit-forming and harmful to general health. Calcium salts used as a preventive are beneficial in some cases. The lactate of calcium in thirty to sixty grain doses in water may be used, or one of the many forms of calcium salts available may be administered as soon as the premonitary symptoms make their appearance, or these may be taken in twenty to thirty grain doses twice a day during the interval. During the attack it is advisable for the patient to lie at rest in a quiet, darkened room free from any disturbance. Hot or cold compresses to the head have proved beneficial in some cases in reducing the severity and duration of the attack and should be tried. Errors of refraction, septic condition of the nose, throat or tonsils, indigestion and constipation, if present require attention; late nights, heavy indigestible meals and alcohol should be avoided. Some preparations of ergot, particularly ergotine tartrate, have been used with success to cut short an attack.

SERUM SICKNESS. Serum sickness or serum disease is an allergic reaction caused by the injection of a serum as a prophylactic or curative measure in a sensitive person. Usually it comes on after an incubation period of from seven to ten days after the injection. It is characterised by irritation of the skin, urticaria, joint pains, and swelling of the lymphatic glands. The severity of the reaction depends on the degree of sensitiveness and the quantity of the serum injected. In very rare cases in hypersensitive persons it is immediate, shock-like and very severe and may prove fatal within a few minutes of injection. In many persons, if a second dose of the serum is injected during the incubation period of the first one, the reaction is immediate and severe.

In ordinary cases, after the incubation period, there is some itching of the skin, urticaria or other skin rash, swelling of the lymphatic glands and pain in the joints, all of which subside within a week or so. The skin eruptions vary in size and number, some of which may be as large as the palm of the hand. Fever is present when the skin rash develops and is of a remittent or an irregular type, but is not high and does not last long. The eruption is seen on the chest, back and face. The lymphatic glands are swollen, those nearest the site of injection being the first to be affected. Joint pain is mostly felt in the small joints of the fingers, but bigger joints are also affected. The disease lasts for three to six weeks. Immediate reaction, which occurs in a small number of cases, consists of difficulty in breathing, itching and burning of the skin, rapid pulse and a sense of great discomfort. These require no special treatment and subside after a short time ; but, if severe, are relieved by a hypodermic injection of adrenalin chloride solution.

Immediate fatal results from serum injection are very rare and are due to extreme hypersensitiveness of the individual. Persons who suffer from asthma or show other allergic reactions when in the proximity of a horse are very liable to get a very severe or fatal reaction after an injection of horse serum. Such a reaction is likely to occur in a sensitive person who has previously received an injection of horse serum which has the effect of making him more sensitive. In such cases the onset is quite sudden and comes on before the injection is completed and the symptoms develp so rapidly that death takes place within twenty minutes or it may be delayed for a few hours. Fortunately such cases are very rare.

Except in those rare highly susceptible cases, fatality from serum sickness is unknown and even severe cases recover without any permanent ill-effects. Allergic persons retain the sensitiveness to serum for years and require special precautions in case an occasion arises for the administration of serum. A doctor should always be informed before a patient is given an injection of serum, if he has been previously injected for any reason.

There is no specific treatment for cutting short the sickness, but in severe cases a certain amount of relief can be afforded by treating the symptoms. For troublesome itching and burning a soothing lotion of calamine and carbolic acid (No. 41) may be applied to the part by soaking a piece of lint in it and keeping it on the affected area. An alkaline bath, consisting of a weak solution of bicarbonate of sodium in warm water, is also beneficial and may be used several times a day. Persons known to be sensitive to serum are given an injection of adrenalin solution with 1/100 grain of atropine sulphate just before the injection of the serum.

URTICARIA. Urticaria is an allergic reaction in which there is a sudden appearance of slightly raised patches or wheals on the skin accompanied by severe burning and itching, lasting for two or three days or longer. The wheals occur on the limbs, body, and sometimes on the face also. It is due to many causes, the local cause being bites and stings of insects, contact with jelly fish or irritating juices of certain plants. In infants and children it is often due to an irritation of the stomach or intestines from errors in diet, constipation, or intestinal worms. But in the majority of cases and in adults it is due to an allergic condition, usually sensitiveness to some article of food. In children it may be cow's milk, eggs, meat, cereals, etc., while in grown up persons, in addition to these, fish or shell-fish, some fruits or vegetables may be responsible for it. Some drugs and transfusion of blood may also produce it. Mental strain, great anxiety, and strong emotional disturbance, especially in women, and menopause have been known to produce it; while in many cases no cause can be found.

The onset is quite sudden and the symptoms are confined to the skin alone, but in some cases there may be fever and general disturbance also. The skin patches vary in size, are circular, raised above the surface, and are accompanied with intense itching and burning lasting for some hours or for two or three days, after which they subside and the wheals disappear leaving no trace of their presence. Fresh crops may appear on other parts of the body for some days or months. In rare cases they appear in the mouth and throat or on the eyelids.

The treatment consists in finding out the cause and removing it if possible. In a large majority of cases the patient is aware of the offending article and is able to avoid it. In children, errors of diet, digestive disturbance, constipation, and intestinal worms require appropriate treatment. In case of a very severe attack, if the patient comes under observation early, the stomach may be emptied by an emetic draught (No. 5). In persons who have had no previous attacks, urticaria is due to digestive disturbances, intestinal worms, or diseases caused by animal parasites. Persons subject to it should avoid alcohol, indigestible food, overloading of the stomach and exposure to cold. The irritation of the skin can be relieved by the application of a soothing lotion (No. 41) or acetate of lead lotion. A hypodermic injection of a few drops of a solution of adrenalin hydrochloride is also useful for the purpose.

OTHER REACTIONS PRODUCED BY ALLERGY

ENURESIS OR BED-WETTING. Persistent bed-wetting in children is very strongly suspected to be due to allergy. Other allergic diseases may be present in the same child and very often there is a history of such conditions in other members of his family. By keeping a record of all the articles eaten by the child it may be possible to find out the item responsible for it (See Bed-wetting).

GASTRO-INTESTINAL DISTURBANCES. Minor varieties of such disturbances are commonly caused by allergy and the patient learns from experience which articles do not agree with him and avoids them. Children show dislike for such articles and should not be forced to take them. The symptoms produced are nausea, vomiting, abdominal colic, indigestion, and sometimes diarrhoea. These may be severe and simulate some serious abdominal disease. The treatment is obvious.

HEADACHE. Apart from migraine, the common variety of headache is met with as a result of allergy. It comes on some hours after partaking of the food, usually in the morning or at mid-day and continues for some hours, sometimes for a day or two. It commences in the forehead and spreads to the back or may commence there to start with. This may be the only sign of allergy or there may be other manifestations of it present in the same individual. A powder containing five to ten grains of aspirin and three grains of citrate of caffeine (No. 135) taken with a little water or vomiting induced with a copious draught of warm water and common salt gives speedy relief.

MENTAL CONFUSION AND OTHER NERVOUS SYMPTOMS. Mental confusion, inability to concentrate the mind, drowsiness or sleeplessness, usually accompany migraine, but may occur independently of it. These last for some hours and disappear without any treatment or after vomiting.

NEURALGIA. Neuralgia due to allergy generally affects the nerves of the face, but may attack any nerve in the body. The most agonizing variety of facial neuralgia is known as trigenimal neuralgia, which in some cases has been found to be due to allergy. In such cases a careful record should be kept of all the articles eaten so as to determine the cause before any surgical operation is undertaken.

ALLERGY DUE TO CERTAIN PHYSICAL AGENTS. Heat, cold, exposure to strong sunlight, or contact with certain dyes is also liable to produce unpleasant symptoms in susceptible persons. Eczema and the inflammation of the skin are caused by exposure to cold or heat. Redness of the skin, blisters, eczema, etc., are caused by the direct action of the rays of the sun. Sometimes the exposure to a therapeutic dose of ultra-violet rays or x-rays has been known to produce serious skin trouble. Certain dyes used in fabrics, especially in socks and underwear, produce skin reactions in susceptible persons. The treatment of all these conditions is carried out on the same lines as described above, viz., to find the cause and avoid it.

In addition to the above described reactions some other diseases, such as epilepsy, joint pains, shingles, etc., behave very much like allergic disturbances.

CHAPTER 6

ANIMAL PARASITES AND DISEASES PRODUCED BY THEM

Many diseases are produced by animal parasites which infest different parts of the human body ; the most frequently observed are the intestinal worms of which there are several varieties. Others live in different organs, such as lungs, liver, muscles, veins, and lymphatic vessels. Some of these are rare and do not produce any serious symptoms, while others give rise to troublesome diseases. Some of the more important ones and the diseases they produce are described below.

BILHARZIASIS OR BILHARZIA DISEASE. Bilharziasis is a chronic disease, endemic in certain countries, which is produced by a small animal parasite, known as *bilharzia haematobia.* This parasite infests the veins, especially of the urinary bladder and rectum, where it lives in large numbers and discharges its eggs which pass out with the urine and faeces and cause irritation and inflammation of bladder and rectum and bleeding from these organs. The adult worm is from 1 to 2 cm. in length. The egg, on reaching fresh water, liberates an embryo which enters the body of a fresh water snail where it develops and is discharged into the water. When the worm comes in contact with the human skin it penetrates it, enters a vein and travels as far as the liver. The disease is endemic in Egypt, North African countries, South, East and West Africa, Palastine, Iraq, South Arabia, China and Japan. Some imported cases have been seen in India, but so far no endemic centre is known to exist in the country.

The symptoms appear about four weeks after the exposure to infection. The adult parasite may be present in the body for years without producing any symptoms, and indeed its presence itself is harmless ; but the ova, which it produces in large numbers, pass through the thin walls of the veins into the bladder and the rectum and cause trouble. There may be no other symptom than the passage of a small clot of blood or a little bleeding after micturition. This is often followed by inflammation of the bladder or rectum or both. This may extend to the kidneys and prove fatal, or death may take place from exhaustion. The ova can be detected in large numbers in the urine and faeces on microscopic examination. Many patients lead a normal life without much trouble, while some few recover spontaneously after months or years. Those treated early and removed from the source of infection get over the trouble completely.

The specific treatment consists in administering intravenously a solution of tartar emetic (sodium antimony tartrate) which kills the parasite and destroys the ova. The initial dose is half a grain of the drug dissolved in ten c.c. of freshly distilled water, which is gradually increased to 2 grains and administered every other day until a total of 20 grains is given. Any leakage of the drug under the skin is very painful. Organic compounds of antimony, sold under different trade names, are now available, and these are less toxic and just as efficacious. The disease takes three weeks to disappear with treatment.

As the embryo of the worm lives in fresh water of rivers, lakes, canals and marshes and enters the body through the skin, the preventive measure consists in avoiding the infection. In endemic areas all water for drinking and washing purposes should be boiled and wading in marshes and bathing in rivers and lakes avoided. Patients should be warned against passing excreta in or near water.

FILARIASIS. Filariasis is a chronic disease produced by the presence in the lymphatics of minute worms known as *filaria bancrofti*, from Dr. Bancroft of Brisbane who first found and described the worm. The female, which measures 50 to 60 mm. in length, periodically discharges a large number of embryos into the blood stream, especially at night. These are sucked up by the mosquito with the blood and undergo further development in its stomach and are transmitted to other human beings through the bite. Both, anopheline and culicine mosquitos convey the disease. The parasite is found in many tropical countries, mostly in a broad belt along the sea coast. It is fairly common in India, Ceylon, Malaya, China, Northern Australia, Pacific Islands, Africa, and parts of South America.

The symptoms produced by the worm are due to the obstruction caused by its presence in the lymphatic channels and their severity depends on the degree of infestation; in many mild infections few or no symptoms are present. The presence of the parasite in the lymphatic vessels causes lymphangitis, i.e., the inflammation of these channels; they become red and painful and those situated under the skin can be felt as thin hard cords. Lymphatic glands may also be inflamed and painful. During an acute attack fever and general disturbances are also present, but they subside after three or four days leaving the affected limb hard and swollen. Such attacks are repeated at irregular intervals and each time the part is left more swollen than before. The lower limbs, scrotum, buttocks, and sometimes the upper extremities are affected. The affected part is enormously swollen and its skin is thick and hard; the condition is known as *elephantiasis.*

A very distressing symptom often found in filariasis, is what is known as *chyluria*, i.e., the presence of chyle in the urine, which is the milky fluid absorbed by the intestinal lymphatic vessels from digested food. This fluid, instead of passing into the general circulation, is discharged into the bladder on account of the obstruction caused by the presence of the parasite in the lymph channel. The urine is of a milky white colour. It is not directly dangerous to life, but the constant drain of nourishment from the body gives rise to wasting, anaemia, weakness and mental depression. The enormous swelling of the legs and the weight impede locomotion and incapacitate the patient from work.

There is no specific treatment for this disease, but the use of sulpha drugs has given very encouraging results, especially if used early. Symptoms are treated as they appear and during the active stage with fever, rest in bed, elevation of the affected limb on soft pillows and the application of a cooling lotion (No. 42) to it are indicated. A small towel or a large piece of lint soaked in the lotion is spread on the limb and kept constantly wet. When the acute symptoms subside, an elastic bandage or stocking should be constantly worn but removed at bedtime. Chyluria calls for rest in bed, limitation of fluid intake and the elevation of the foot of the bed so as to encourage the flow of chyle in the right direction. Excessive enlargement of the scrotum or limbs may require surgical operation if it interferes with locomotion. The patient should go out of the endemic area as soon as possible to prevent further infection.

As the parasite is conveyed to human beings by mosquitos, the same precautions as described under malaria, are indicated.

GUINEA WORM DISEASE OR DRACUNCULOSIS. Dracunculosis is a chronic disease caused by a parasitic worm, popularly known as *guinea worm.* The female worm, which is responsible for the disease, is from 20 to 90 cm. in length and about 1.5 mm. in thickness. The disease is common in many parts of India, Arabia, Iran, Egypt, Uganda, West Africa, and South America. In these countries it is not extensively spread, but is confined to certain localities, where water for drinking purposes is obtained from wells, tanks, etc., which are contaminated. The female worm, when it appears on the surface of the body, discharges embryos in large numbers ; these on reaching fresh water swim about very actively and enter the body of a fresh water mollusc, from where, after further development, they are set free. They gain entrance into the human body through drinking water which is not filtered or boiled.

After gaining an entrance into the human body the embryo takes about twelve months to attain full maturity, till then no symptoms are produced. The adult worm travels to the lower parts of the body, generally the legs, and tries to come out through the skin; a small blister or an abscess is formed at the site, which bursts and shows one end of the worm. The parasite is thin, cord-like in appearance and greyish white in colour and takes a long time to come out through the opening. The projecting end discharges embryos in profusion. The worm extends for a long distance under the skin and winds itself round muscles, bones and other deeper structures, or it may be coiled up in some part of the body, where sooner or later it forms an abscess. In such cases the whole worm can be removed by opening the abscess. Occasionally it dies and is calcified and remains in this state indefinitely without producing any symptoms. There may be more than one worm present in the body. If not broken by rough handling, the worm ultimately comes out completely, but if broken it might form an abscess and give trouble. It is possible to estimate its length and the course taken by it in the limb by taking an x-rays picture after injecting a fluid opaque to the rays through the projecting end of the worm.

Treatment consists in encouraging the worm to come out by itself, no force should be used to pull it out, as it is likely to break and give trouble. If it presents itself in the lower extremity, the best treatment is to put the limb in a bucket of water for an hour twice a day and wind the projecting end round a small piece of clean lint. It discharges its embryos in water and will come out completely in three or four weeks. When it is situated under the skin and does not wind itself round deeper structures, it can be removed by a minor surgical operation. The injection of a solution of corrosive sublimate (1 in 1000) through the projecting end kills it and expedites its discharge.

Prevention consists in protecting all drinking water from being infected by the embryos. Step wells and ponds from where villagers get their drinking water are very liable to be infected. All drinking water should be boiled so as to kill the embryos if present.

TRICHINIASIS. Trichiniasis is a chronic disease produced by a minute parasitic worm called *trichina spiralis.* It lives in the small intestine where it discharges its embryos which enter the blood-vessels and are carried to the muscles, especially those of the neck, chest and diaphragm, where they become encysted. The female is 3 to 4 mm. in length and the male half this size. The parasite is chiefly found in pigs, but other animals are also capable of harbouring it. Pigs become infected by feeding on slaughter house refuse or human excreta which is infected. The pork, which has the encysted embryos of the worm, is known as *measly pork ;* and human beings get infected by eating under-cooked infected pork. The disease was at one time very common in European countries, but now it is very rare on account of protective measures adopted against it. In India and other eastern countries, where pork is not ordinarily used as food, it is rarely seen.

The severity of the symptoms depends upon the degree of infection. The presence of a small number of embryos in the muscles may cause no inconvenience to the patient, while a large number may cause death. During the invasion period, which lasts for a week or ten days after the ingestion of the infected pork, when the embryo undergoes development in the intestine, there is nausea, vomiting and diarrhoea. During the the next stage when the embryos migrate to the muscles, there is pain and tenderness in them, especially in the muscles of the legs, neck, jaw and chest. Mastication of food and swallowing are difficult and painful and there is difficulty of breathing when the muscles of respiration are affected. Fever is present and varies in severity ; the temperature may rise to 104° or 105° and remain at this height with a little diurnal variation. The face becomes puffy and swelling may also be present in the limbs. The patient becomes pale, anaemic and debilitated, loses sleep and becomes delirious towards the end. Mild cases recover after three weeks. Death may take place from exhaustion during the sixth or the seventh week or later from pneumonia. The disease is liable to be mistaken for rheumatism, but the pain in trichiniasis is confined mostly to the muscles of the chest, neck, jaw and larynx, while in rheumatism the joints are involved.

If it is suspected within a few days that infected pork has been eaten, a strong purgative should be given. For this purpose 3 to 4 grains of calomel, followed after some hours by magnesium sulphate, should be given to get rid of the parasite from the intestine. The same may be repeated after 48 hours. When the embryos have invaded the muscles there is no known remedy to destroy or remove them and the symptoms are treated as they arise and the patient's strength and health maintained. Intravenous injections of sodium antimony tartrate (tartar emetic) have been found to be beneficial ; they are given as described under bilharziasis. By way of prevention, pork that is infested and undercooked pork should be avoided.

HYDATID DISEASES OR ECHINOCOCCOSIS. It is a chronic disease caused by the larva of a worm called *tenia echinococcus.* The adult parasite lives in the intestine of the dog, jackal, or some other animals. Its ova are passed out with the excreta and when they gain an entrance into the human alimentary canal, the larva is hatched out and travels from there to the liver, lungs, brain or some other organs where it dvelops into a cyst, which may grow to a very large size and is known as the hydatid cyst. The disease is common in Iceland, Australia, parts of North Africa, the Cape, South America, and Arabia. In India it is rare. It mostly occurs among persons who associate closely with dogs.

A small or moderate cyst may produce very little inconvenience to the patient, unless situated in a place where it exerts pressure on some delicate tissue. In the liver it may grow to a large size before it becomes troublesome. The liver shows an enlargement or a bulge in front or on the right side. The patient feels a dragging pain in the abdomen while standing or walking that is partly relieved when he lies down. There may be jaundice from pressure on the bile ducts. There may be no other symptoms unless the cyst suppurates, as it does in some cases, when there is severe pain, fever, and general disturbance of health. If situated in the lungs it causes cough, pain and difficulty of breathing on account of pressure on the soft lung tissues. The cyst may burst and its contents coughed out through the air-passages. In the brain it produces serious symptoms of compression which terminate in death.

Its presence may be suspected when there is a large bulge for which there is no other cause. The bulging cyst gives a peculiar vibration when tapped with the fingers. This can be elicited by placing the palm of the left hand flat on one side of the bulge and tapping the other side with the tips of the fingers of the right hand. The diagnosis is confirmed by tapping the cyst and examining the contents. In the brain it causes the symptoms of a tumour, the nature of which cannot be determined during life, unless another cyst is present in some other part of the body.

If the cyst is situated in an accessible part of the body it can be removed by a surgical operation. The dog that shows the presence of the adult worm in the intestine should be properly treated to get rid of the parasite and its excreta burnt or buried deep in the ground. Dishes for feeding and watering the dog should be kept separate and clean, and the hands or any other part of the body licked by it should be washed immediately with soap and water.

INTESTINAL WORMS. There are several varieties of worms that infest the human intestine. They have long scientific names but are known popularly according to their size and shape. They are divided into the following classes :—round worms, thread or pin worms, hookworms, and tape worms.

ROUND WORMS (Ascaris Lumbricoides). The worm, when it is fresh and alive, is pinkish or greyish red in colour. The female measures from 15 to 30 c.m. in length, while the male is about half the size. It is one of the commonest parasites that infest the intestine of man and is of world-wide distribution. It is more frequently found in children than in adults. Its eggs are found in the stools and are readily seen under the microscope. Minute embryos are developed after the eggs are discharged and these when swallowed grow into adult worms in the intestine.

In a large number of cases it produces no symptoms and its presence remains undetected until one or more is passed per rectum or by the mouth. When present in large numbers they are coiled up in the intestine and may produce symptoms of intestinal obstruction. They sometimes wander to distant organs and may appear in the stomach or in the air-passages and are vomitted or coughed out ; one of them might enter the biliary passage and cause obstruction to the flow of bile.

A strong purgative is all that is required to get rid of the worms from the intestine. Oil of chenopodium is given to kill the worms, the dose for an adult being 12 minims given on an empty stomach, followed after an hour by magnesium sulphate; only one dose is sufficient for the round worms. The dose for children is one minim for every year of age, mixed with a little castor oil. Another drug which is useful in this disease is known under the trade name of *ascaridol.* It is available in capsules each containing 4½ grains. To an adult one such capsule is given three times with an interval of two hours between each, followed after two hours by a purgative.

THREAD WORM OR PIN WORM. This is a minute worm which is found in large numbers in the upper part of the large intestine mostly in children. It is whitish in colour and the female is about 10 m.m. in length, while the male is much smaller. It has a world-wide distribution. The child infested with it might suffer from nausea, loss of appetite, and sometimes from vomiting and itching near the anus. The female worm crawls to the end of the rectum where it deposits her eggs and the child scratching the part may carry them to the mouth and reinfect himself.

Chenopodium oil (No. 4) may be given, followed by a purgative and an enema to clear the bowel of the worm and its eggs. The dose for children should be regulated as mentioned under round worms, and no more than one dose should be given. Measures should be adopted to prevent the child from transferring the eggs from the anus to the mouth.

HOOKWORM DISEASE, OR ANKYLOSTOMIASIS. Hookworm disease is caused by a large number of small worms, called hookworm on account of its hook-like mouth with which it attaches itself to the mucous membrane of the upper part of the small intestine and sucks the blood. The disease is prevalent in almost all parts of the world, but is more common in the tropical and sub-tropical regions and affects chiefly the rural population and those who work in mines. The female worm is 20 m.m. long and the male is half the size. The eggs are discharged abundantly in stools and when they reach damp soil, develop into embryos which remain alive for three months. They penetrate the skin when they come in contact with any exposed parts of the body, enter the blood stream and ultimately reach the small intestine where they develop into adult parasites. Though each individual worm draws a very small quantity of blood the total loss on account of their large number is very great.

The symptoms vary according to the degree of infestation ; in mild cases there may be no noticeable symptom, but in severe ones of some duration, there are anaemia, weakness, difficulty of breathing, pain in the chest, palpitation and puffy swelling of the face and limbs which render the patient unfit for any kind of physical or mental work. The earliest symptom, which is often found in those who have exposed themselves to the infection, is what is known as *ground itch.* It consists of an itching sensation at the site of infection, usually in the feet. Small vesicles or pustules may form here or even ulceration from scratching. This early local symptom lasts for a week or so and subsides spontaneously. Sooner or later anaemia sets in followed by other symptoms. Children or growing persons with severe infection show defective physical as well as mental development and are dull and apathetic.

In an endemic area its presence may be suspected in a person who is suffering from anaemia and general debility, especially if a history of *ground itch* is available. The eggs can be detected in the stool if it is examined under the microscope. The disease is not directly dangerous to life and if taken in hand early a positive cure can be brought about without difficulty.

Many drugs have been successfully used in the treatment of this disease, the three most common being, thymol, oil of chenopodium, and carbon tetrachloride. The last is used in the army for deworming recruits, being more convenient to administer to several persons at a time. It is more toxic than the other two and sometimes produces unpleasant symptoms. For the administration of thymol the bowels should be empty, no food being given at night. A mild saline purgative is given so as to empty the contents of the bowel and in the morning 15 grains of powdered thymol are given with a little water, to be followed by two other similar doses with an interval of one hour between each powder, and another dose of saline purge two hours after the last powder so as to remove the thymol, as otherwise it might get absorbed and produce toxic symptoms. Oil of chenopodium does not require emptying of the bowels and no preliminary purgative is necessary. It is administered to an adult in three doses of 8 minims each every hour, either dispensed in capsules or in an emulsion (No. 4), the last dose being followed after two hours by a saline purge.

For carbon tetrachloride no preliminary fasting or purging is necessary. The drug is administered in 30 to 45 minim doses according to the physical condition of the patient, in the morning, well skaken with two ounces of a saturated solution of sulphate of magnesium. The purgative should be repeated after two hours if the bowels have not moved by then. The treatment has to be repeated in every case after a fortnight so as to get rid of all the parasites.

General preventive measures consist in preventing the infection of soil or water in endemic areas. This can be done by providing ample privy accommodation in labour camps, miners' lines and villages, and prohibiting inhabitants from soiling the ground. Contact of bare skin with mud or damp soil should be avoided as the larvae remain alive in it for a long time.

TAPEWORMS. There are several varieties of this worm, but three of these commonly infest the human intestine. The adult worm, as its name implies, is a flat long ribbon-like parasite which inhabits the intestinal canal of man and some animals. It has a very small round head and a thin segmented neck, the fully developed body consisting of a large number of flat segments. The total length varies in different species and may reach several yards. The head attaches itself to the mucous membrane of the intestine by means of suckers, and the fully developed segments, which contain the eggs, are discharged in varying lengths with the stool. The eggs, when they enter the alimentary canal of other animals, such as cows, pigs, etc., hatch out the embryos which make their way to the muscles where they remain in that state until the flesh is eaten by human beings. Thus they reach the intestinal canal where they develop into adult worms. The three varieties, which are found in human beings, are :—

(1) PORK TAPEWORM (Taenia Solium). The larval state of this worm is found in pigs, wild boars, cats and other vertebrates. They are sometimes found in human beings also. The pork infested with the larvae is known as *measly pork*. They are destroyed by heat in the ordinary process of cooking, but when the pork is undercooked the heat does not sufficiently penetrate the deeper parts and they escape destruction. This parasite has a world-wide distribution, but Moslems and Jews who do not eat pork are free from it. The pigs that feed on garbage and human excreta swallow the eggs which hatch out the embryos in their stomach and these migrate to the muscles and become encysted there.

(2) BEEF TAPEWORM (Taenia Saginata). The adult parasite, like the above, lives in the intestine of man only and the larvae are found in the muscles of the ox only. These enter the alimentary canal of man through eating uncooked or undercooked beef. The worm is common in all the countries of the world and is very prevalent in countries where raw beef is eaten, as in Abyssinia. The length of the adult worm is from ten to twelve yards or more. Mature segments, which contain eggs, are discharged in stools and when these are swallowed by the animal, the embryos hatch out and reach the muscles where they remain until they get a chance to enter the stomach of man.

(3) FISH TAPEWORM. (Bothriocephalus Latus). It is also known as the Broad Tapeworm. The length of the adult worm is from two to ten yards; its larval form is found in the fish. It is very prevalent in some parts of Europe, Iceland, America, Africa, China and Japan. The symptoms produced by all these and the treatment to get rid of them are similar and are described below.

The presence of tapeworms in the intestine may not produce any noticeable disturbance of the general health for a long time. Occasionally there may be colicy pains in the abdomen, a sense of pressure and discomfort, nausea, vomiting, and impaired appetite with constipation and occasional diarrhoea. Segments of the parasite, sooner or later, make their appearance in the stools, especially after a purgative. Anaemia and debility might develop in long standing cases.

The specific treatment for tapeworms is the administration of the liquid extract of male fern. The treatment should not be given to debilitated persons and pregnant women. Twelve to eighteen hours before giving the drug the patient should not take any solid food, though he may take some soup or a glass of milk ; at the end of the fasting period he is given a mild saline purgative to empty the contents of the bowel.

One hour after the saline, the liquid extract of male fern is given, its dose for an adult being 45 to 90 minims according to the physical condition of the patient. It has an unpleasant taste and is apt to cause vomiting; it is therefore prescribed in gelatine capsules, each containing 15 minims; it might be prescribed in the form of a draught (No. 6). The patient should remain in bed during the treatment. After four hours another saline purgative is given and the stools examined for the head of the worm which is very small and round and requires a magnifying glass to identify it. If the head has not come out or if other worms are present, the segments will appear again in the stools after some time; if so, the above treatment should be repeated after an interval of six to eight weeks. The dose of the medicine for children is 3 to 4 minims for every year of life, but weak children should receive less.

Another drug, not so unpleasant to take, used in the treatment of tapeworms, is *pelletierine tannate* which is prepared from the stem and root bark of the pomegranate plant. It is a yellow powder which is given with a little water or dissolved in alcohol, the dose being 5 to 7 grains for an adult and proportionately less for children. It is followed after two hours by an ounce of castor oil. In Iran a decoction made from the pomegranate root is used with success. Another simple and equally efficacious remedy used in India is pumpkin seeds, *curcubita maxima*. The outer seed coat is removed and 3 to 4 drachms of the kernel is ground with sugar and the resulting pulp is given with a little jam or honey on an empty stomach, followed after two hours by a mild purgative. Areca nut or *supari* (*areca catechu*) is extensively used in India and China as a remedy for this parasite. Three to six nuts are crushed and boiled for half an hour in water and the resulting decoction is taken on an empty stomach. No purgative is necessary, but if the bowels do not move a purgative might be given after three hours. Areca nut is used for getting rid of tapeworms in dogs and puppies, in whom it also acts as a strong purgative. Finely powdered nuts or a paste obtained by rubbing the nut on a flat piece of stone with a little water is given after fasting for 12 to 18 hours, the dose being two grains of the powder for every pound of the body-weight of the dog. As the larvae of the tapeworm are found in beef, pork, and fish, and these are destroyed by heat; raw and undercooked meat should be avoided.

CHAPTER 7

TROPICAL ABDOMINAL DISEASES

SPRUE. (Psilosis or Tropical Diarrhoea). It is a chronic disease of the alimentary tract found in the tropics mostly among Europeans who have been long in the tropics ; the native races suffer much less frequently. Irregular habits, an ill-balanced diet containing too much protein or carbohydrates and a prolonged residence in an endemic area are the predisposing causes.

The onset of the disease is gradual, the earlier symptoms being indefinite with acid dyspepsia, flatulence, constipation or alternate constipation and diarrhoea, weakness, mental depression and want of sleep. The severity of the disease and its rate of progress depend on the age, physical condition, previous health and habits of the patient. If untreated the condition gets steadily worse and when fully developed the patient gets soreness of the tongue, distension of the abdomen, diarrhoea, loss of weight and great weakness. The gullet is sore so that swallowing is painful, and sooner or later soreness is felt at the anus and the patient complaints of being sore from the mouth to the anus. The stools are copious and more frequent in the morning, they are light coloured, frothy and of a pungent odour. In old cases cramps in the limbs are very distressing. Occasionally temporary improvement takes place but unless proper treatment is taken the condition deteriorates and may be fatal.

Sprue is an obstinate disease and unless properly treated in time completely incapacitates the patient. Recovery takes place in young persons if treatment is commenced early. The outlook is serious in persons over fifty and those who have some other chronic debilitating disease. For its successful treatment complete rest and a strict regimen as regards diet are absolutely necessary. Medical advice should be obtained in the early stage. In sprue fat and starch are not digested, so the diet should contain as little of these as possible. A moderate quantity of milk or skimmed milk, eggs, chicken, lean meat and vegetables might be taken. Toast and dry biscuits might be added and one of the predigested foods substituted for milk. Yeast or one of the preparations containing it, is beneficial. Diarrhoea can be controlled by the diet, but if troublesome a powder containing 15 grains each of bismuth subnitrate and aromatic chalk powder twice or thrice daily is useful. Preparations containing opium would be required very rarely. Calcium is beneficial in sprue, 30 grains of calcium lactate or some other salt of it might be taken twice daily.

The mouth requires frequent cleaning with a weak solution of permanganate of potassium ; it should be painted with boric acid glycerin thrice daily. For flatulence mixture No. 67 thrice daily an hour after food is beneficial. The treatment should be continued for six months or longer if necessary and the normal diet restored gradually. For old cases treatment for anaemia is also necessary. The preventive measures are the avoidance of fatigue, irregular habits as regards food and drinks, stale food, excess of fat and carbohydrates, and protection against excessive heat and cold.

HILL DIARRHOEA (Summer Diarrhoea). In India it is a fairly common disease prevailing during the rainy season on many hill stations. It occurs at heights above 1,500 feet and is confined to certain places where it breaks out every year mostly among visitors, though some permanent residents also suffer. In Poona, which is about 1,800 feet above the sea level, it is a regular feature during the rains. So far nothing definite is known as to its cause. Within a week of his arrival the new comer is attacked with diarrhoea without any apparent cause. He wakes up in the morning with an urgent call to stool and passes an abundant liquid frothy motion with little or no griping and feels a sense of relief. He may have to pass three or more stools during the next four or five hours after which the trouble remains in abeyance till the next morning. This may last for a week or in exceptional cases until the patient leaves the station.

The best treatment for it is to take a dose of castor oil in the beginning and abstain from food for 24 hours ; tea, a little milk and toast might be taken and the normal diet restored gradually. If diarrhoea persists after this, two or three powders each containing 15 grains of bismuth subnitrate and an equal quantity of aromatic chalk powder or powder No. 137 might be taken during the day. If the trouble persists the patient should leave the station.

CONGESTION OF THE LIVER. Congestion of the liver, i.e., the stagnation of the blood in it is brought about by habitual indiscretion in diet, excessive use of alcohol, want of exercise, and exposure to cold. In the tropics it is a common complaint among the Europeans who, without regard to the requirements of the body under changed conditions of climate, indulge in the same habits as regards food and drinks as they did in cold countries. The patient has a sense of fullness, oppression or discomfort on the right side in the liver area, which is aggravated after food. Other symptoms are loss of appetite, flatulence, constipation, headache, depression, and sometimes a yellow tinge of the skin and conjunctiva.

The treatment is obvious and consists in giving the stomach and the digestive organs rest for twenty-four hours, taking sufficient outdoor exercise and a purgative, preferably calomel, or the blue pill,(No. 127), four grains of either at bed time followed the next morning by a saline purgative. Heavy meals, especially in hot weather, excess of alcohol, and too much meat and carbohydrates should be avoided.

TROPICAL ABSCESS OF THE LIVER. As its name implies it occurs most commonly in tropical countries and is fairly common in India. Usually it occurs as a result of amoebic dysentery, the infection in the intestine travelling to the liver, but may occur independently of dysentery. The liver is infected in every case of dysentery, but the micro-organism is disposed off by the normal resistance of the organ. But when this is lowered by habitual over-indulgence in alcohol, over-eating, chronic malaria, or any other debilitating cause the infection takes root and the abscess results. It may occur a few weeks after the attack of dysentery or in rare cases it may take two or three years. The onset is insidious with few localizing symptoms and its presence may not be suspected until it has fully developed, or it may come on suddenly with pain on the right side, chills, fever and jaundice. The pain is dull, dragging or aching and is often felt in the right shoulder and is aggravated when the patient lies on the left side, coughs or takes a deep breath. There may be a noticeable bulging of the liver and its lower margin felt below the ribs if the abscess is a large one. The fever is not usually high but may reach 103° or 104° and is of an intermittent type. Loss of appetite, nausea, loss of weight, weakness, and muddy colour of the skin, if the abscess has been for some time, are present. If left untreated the abscess may burst through the diaphragm into the lungs and the contents evacuated through the air-passages, or it may rupture into the intestine or the peritoneum. In the former case spontaneous recovery might take place but in the latter a fatal termination is certain.

An abscess of the liver is a very serious condition and the patient should be placed under medical treatment as early as possible because, if diagnosed early and properly treated, the chances of recovery are good. An abscess situated near the surface is easily accessible to surgical treatment and has better chances of recovery than one deeply situated. The very first step in the treatment is complete rest in bed even if the symptoms are not very urgent. When an abscess is threatened or is of a small size rest in bed, dieting, and a course of emetine hydrochloride injections offer a good chance of getting over it. If this fails tapping the abscess cavity with a special apparatus and washing it out with a sterilized solution of quinine and emetine injections may be successful. If the abscess is of a large size or persists after tapping a surgical operation to drain out the pus is the only treatment left. Very early and thorough treatment of dysentery, even if the attack is a mild one, is quite necessary to guard against the risk of getting an abscess of the liver.

INFANTILE BILIARY CIRRHOSIS. This is an uncommon disease of the liver which attacks infants under one year of age and is mostly confined to India, though a few cases have been seen in other countries. It is much more common among Hindus than Moslems in the proportion of 20 to 1 and is very rare among other communities. It is more prevalent in rural than urban areas and attacks successive children of well-to-do parents more frequently than those of the poor. Its onset is gradual and its presence is not suspected until it has made some progress. The earlier symptoms are loss of appetite, vomiting, constipation, irritability, and slight rise of temperature. The liver is enlarged and can be felt below the margin of the ribs and jaundice soon develops. The urine is greenish yellow on account of the presence of bile in it and the stools are light or clay-coloured. The condition of the child deteriorates progressively and ultimately it dies of exhaustion. The disease becomes less virulent in subsequent children and the third or the fourth child is able to get over it.

There is no specific or effective treatment for this disease. The child should be removed from the locality as soon as it is suspected of suffering from the disease and fed artificially or by a wet-nurse. Subsequent children should not be kept in the locality and should not be nursed by the mother and patent foods containing sugar or other carbohydrates should be avoided.

CHAPTER 8

FIRST AID TO THE INJURED AND BANDAGING

In order to be able to render efficient first aid to the injured it is very essential to possess an elementary knowledge of the human body (Chap. 1). A good deal of unnecessary pain and suffering can be avoided and further damage to the body prevented and very often the life of the injured person can be saved by skilled and timely help given to him. Very often in an accident willing but ignorant passers-by, trying to help the injured, add further to his trouble, if not endanger his life through ignorance. The object of first aid is to remove or reduce immediate danger to life, to prevent further pain and damage and make the injured as comfortable as possible under the circumstances until expert medical help is available. For this purpose, in addition to a knowledge of the human body, the first aid student should have a cool head, plenty of common sense, quick judgment and resourcefulness so as to be able to decide quickly what to do and make the best use of any material available on the spot, as splints, bandages, etc., are not always at hand in an emergency. In an accident, bleeding, if present, should receive immediate attention.

Certain general rules as described below should always be observed while treating an injured person. First of all it should be determined that he is able to breathe freely and that the clothing is loose enough to allow easy breathing, because a patient suffering from shock or unconsciousness is unable to overcome even a slight resistance from tight clothing and might get choked. All clothing should, therefore, be loosened and all bands round the neck and waist removed. If he is lying in the middle of the road he should be lifted up and removed from there and placed on his back. He should not be dragged but carried in the horizontal position keeping his head as low as possible. People should not be allowed to crowd round him and prevent the circulation of fresh air. Complete rest is very essential and he should not be made to get up and walk, as is often done by ignorant persons in street accidents. If he is unconscious and has cold extremities he should be covered and protected from cold. Stimulants should not be administered unless it is quite certain that there is no internal or external bleeding nor any injury to the organs. There is no harm in giving him hot tea, coffee or milk if he is able to swallow. Indiscriminate use of strong stimulants is harmful and likely to endanger the patient's life. The next step is to determine the nature and extent of the injuries and attend to them in order of urgency. The conditions requiring first aid are bleeding, which should be attended to first, shock, unconsciousness, wounds, fractures and dislocation.

BLEEDING (Haemorrhage). Bleeding may be arterial, venous, or capillary. Figure No. 5 shows the scheme of circulation in the body from which it will be seen that the blood is pumped out from the left side of the heart and is conveyed by arteries to all parts of the body where it is distributed through the capillaries, and returned to the right side of the heart through the veins. From there it is sent to the lungs to be aerated and returned to the left side of the heart.

The blood coming from an artery is bright red, and if the cut end is not deeply situated it is seen to spurt out in jets corresponding with the heart beats. As the flow is from the heart, pressure on the artery on the heart side is required to stop the bleeding. Blood from a vein is dark red in colour and flows in a slow continuous stream as there is very little pressure behind it, and it issues from the cut end which is further from the heart, there being no bleeding from the other end on account of the presence of valves in veins which prevent a back-flow. In order to stop bleeding from an injured vein very little pressure on the cut end is required. In such a case no tourniquet is needed. In capillary bleeding the blood is red and oozes from the cut surface and it soon stops by itself and can be controlled easily by light pressure to the bleeding surface. In case of an injury to an internal organ bleeding takes place in one of the cavities in the body, and is known as internal haemorrhage. It may be slight and produce no symptoms, but if it is severe it may be fatal.

The symptoms of severe bleeding are faintness, weakness, giddiness, pallor of the skin, restlessness, hurried breathing, thirst, cold sweat, and thin rapid pulse. The patient moans, throws about his limbs, and if the bleeding is not stopped, loses consciousness and dies. Slight or moderate loss of blood does not produce any symptoms except fright. The loss is soon replaced by the blood-producing organs. A young healthy person is able to stand the loss of a pint of blood without any permanent ill effects. Nervous persons and those who have not seen blood are apt to be upset and faint at the sight of blood ; such persons are incapable of rendering any help and frighten the patient ; they should be removed from the site of the accident.

Ordinary bleeding, unless it is from a large artery, has a tendency to stop by itself in time, and all that is required is a little firm pressure on the cut surface with a clean pad of lint or gauze soaked in a mild antiseptic lotion, or in an emergency a folded handkerchief may be utilized for the purpose. It should be kept firmly and evenly pressed with the hand or by means of a bandage applied round the limbs or the body. Bleeding from a deep artery cannot properly be controlled by local pressure and requires compression of the arterial trunk above the site of injury by means of a tourniquet.

Figure No. 7 shows the course of all the main arteries and the points where they pass over bones and where they can be effectively compressed. They can be felt pulsating at these points, and the reader should make himself familiar with them so that in an emergency he will have no difficulty in finding them. Fingers are very convenient and the pressure applied with them does not interfere with the circulation in the rest of the limb, but they soon get tired. They should be used until a suitable tourniquet is improvised or medical help is obtained. If the bleeding is likely to be stopped by pressure locally, no unnecessary or severe measures should be resorted to. A tourniquet, if properly applied, is the best means of arresting bleeding immediately, but it is not free from many disadvantages and even danger. It stops all circulation in the limb below the site of application and if kept on too long will produce gangrene ; moreover in an emergency a suitable material may not be

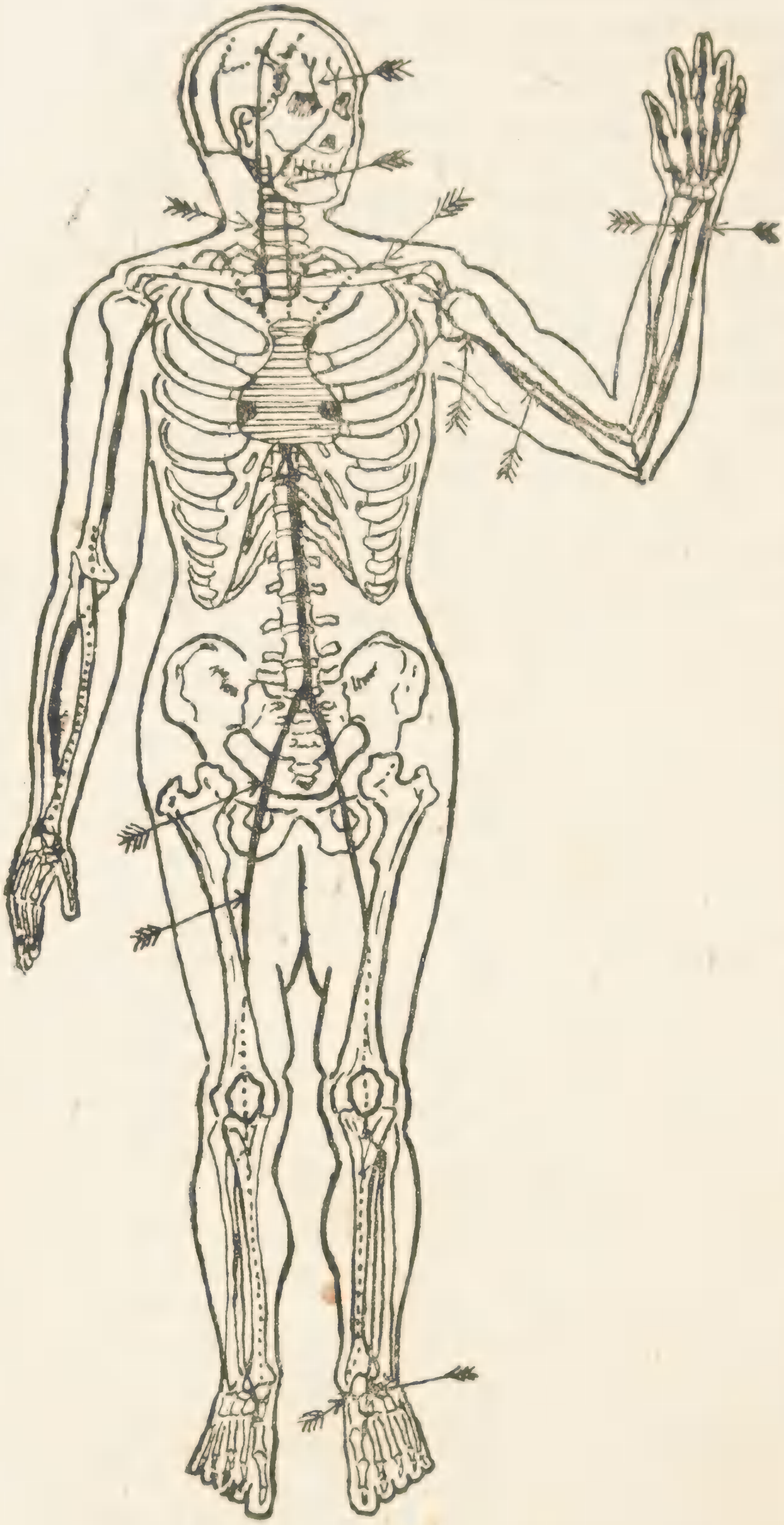

FIG. 7

Diagram showing the course of main arteries in the body. The arrows mark the points where the pulsations can be felt and where digital pressure can be applied to stop bleeding below the point.

available. It should be used only when it is absolutely necessary. It should be broad enough and of such a material as will not cut the skin ; thin string, tape or wire should not be used. A handkerchief is always at hand, and if too short two or three might be knotted together. Rubber tubing is commonly used by surgeons, and if available in an emergency it may be used. It should be firmly but not too tightly applied round the limb. It cannot be left on the limb for a prolonged period otherwise gangrene of the limb is likely to be produced. In young healthy subjects it can be kept for about thirty minutes or so, but in old and debilitated persons it should not remain longer than twenty minutes. If medical help is not available within this period digital pressure should be applied to compress the trunk and the tourniquet loosened for a short while to allow circulation in the limb ; it may be reapplied after some time. When applied to a very fleshy and tapering part of a limb care should be taken to prevent it from slipping down, especially when the patient tries to move or walk. Figure No. 8 shows the method of tightening a ligature by twisting a piece of stick passed under it; this is not necessary when a rubber tube is applied.

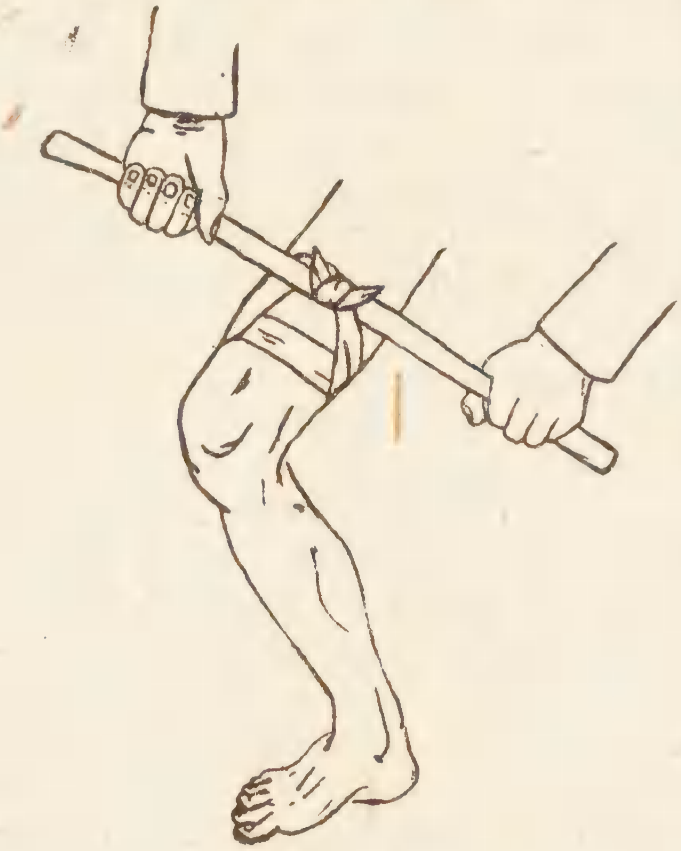

FIG. 8

The method of tightening the ligature round a limb. After a turn or two the stick can be fixed in position with a bandage or handkerchief.

When the bleeding artery is on the trunk it is not always possible to compress the artery or apply a tourniquet. In such cases firm pressure with a pad or tightly packing the wound with lint, gauze or cotton wool soaked in antiseptic lotion should be tried. There is free and sometimes alarming bleeding from simple wounds of the face or scalp without any artery being cut, as these parts are very vascular. In such cases bleeding can be stopped by pressure applied to the bleeding surface with a pad and bandage. In dealing with bleeding all precautions as regards cleanliness as for wounds should be observed as far as possible to prevent further contamination of the wound.

The above measures are of general application but in some cases special measures are necessary on account of anatomical or other peculiarities. The two arteries of the forearm, viz., the radial and the ulnar unite after entering the palm and form two arches from which branches are sent to the fingers and the rest of the hand. An injury to either of these arteries will cause bleeding from both the cut ends, and compression on both sides or a tourniquet on the limb is necessary to stop the bleeding. In case it is not severe and no bleeding from a large branch is present, it can be controlled by the application of a pad which is gripped firmly by the patient in his hand over which a bandage is applied so as to prevent his fingers getting tired.

If the bleeding is high up in the arm and there is no room to apply a tourniquet above the injury, compression can be effected by the thumb pressing in the armpit in an upward direction against the artery as it emerges from the thorax. It may be possible to compress it with a pad of suitable size in the armpit, the arm being firmly bandaged to the side of the body.

When the *carotid artery*, i.e., the large artery in the neck is injured the bleeding is profuse and unless checked quickly causes death. It is deeply situated and is covered throughout its whole length by muscles and is not easily damaged. In suicides, unless the attempt is determined, it escapes injury. Its pulsation can be felt in the lower part of the neck a little above the inner end of the collar bone where it can be compressed against the spine. There is bleeding from both the cut ends as the arteries on both sides communicate freely with one another through their branches. As no tourniquet can be applied to the neck digital pressure has to be applied until medical help is available.

Bleeding from the foot can be controlled by a pad and pressure of a bandage, but if severe, a tourniquet will have to be applied above the ankle. Bleeding from the *femoral artery*, which runs in front of the thigh, can be controlled by a tourniquet applied on the upper third of the thigh, but if the injury is so high that a tourniquet cannot be tied, digital pressure should be applied in the middle of the groin where the artery comes out of the abdomen and enters the thigh where its pulsation can be felt. Being a large artery considerable pressure is required to stop the flow, the attendant is therefore likely to get tired ; a relay of assistants should be arranged in such a case until medical help is available.

Apart from vomiting of blood (q.v.), bleeding from the *mouth* may be due to an injury of the tongue, cheeks, lips, palate, tonsils, or gums. As a rule it is not serious except in bleeders, i.e., haemophilic patients, and can be easily checked with a pad and pressure which the patient can himself apply by closing the mouth firmly. Mere oozing of blood from any part of the mouth can be stopped by sucking a piece of ice.

Bleeding from the *ear* in children is due to an injury caused by the introduction of a foreign body. It is not severe and does not require any special measure to stop it. The auditory canal should be inspected in good light, and if a foreign body is present it should be removed with a pair of forceps or by gently syringing with boric lotion, and after drying the ear with a swab of cotton wool a few drops of carbolized or boric glycerin should be dropped into it. In case of an accident the bleeding from the ear is a sign of the fracture of the skull ; the patient is unconscious and suffers from concussion of the brain. The blood that comes out is thin and watery, being mixed with the cerebro-spinal fluid which escapes from the cranial cavity. In such a case the ear should be cleaned with some antiseptic lotion and plugged with cotton wool.

Bleeding from the *urethra* is due to an injury of the perineum caused by falling astride a hard object. It is not severe and stops by itself, but is likely to be followed by a troublesome stricture of the urethra. It is therefore very advisable in every case of injury to the perineum to consult a surgeon so as to adopt measures for the prevention of this trouble. If the bleeding continues, cold compresses or ice may be applied to the perineum. Apart from an injury, bleeding from the urethra is due to some disease of the urinary tract, infection with bilharzia worm (q.v.) or an injury to the bladder. In children and hysteric women the introduction of a rough foreign body is a frequent cause of such bleeding. In females the foreign body is apt to slip into the bladder and cause serious trouble if not removed early.

Epistaxis or bleeding from the *nose* may be due to an injury. In children it is often due to the introduction of a foreign body. In full-blooded plethoric persons and those suffering from high blood pressure it is an attempt on the part of nature to relieve herself, and unless it is severe and persistent it should not be checked. It commonly occurs in the beginning of many acute infectious diseases and in some diseases of the blood. The presence of polypus or some other growth in the nose may also cause it. Nasal bleeding, unless persistent, does not require any special treatment and stops by itself after a few minutes. The patient should remain in an upright position, hold the nostrils and breathe through the mouth. An ice-bag, a piece of ice or cold compresses might be applied to the head or forehead, and if the patient feels weak he should lie down on the bleeding side and breathe through the mouth. In persistent bleeding when simple measures fail it becomes necessary to plug the nostril with thin long strips of sterilized gauze with a pair of forceps. This requires some experience and knowledge of anatomy of the nasal cavities.

Bleeding from the *lungs* results either from an injury or disease of the lungs or air passages (see haemoptysis). A penetrating wound of the chest damaging the lung is followed by spitting of blood which is frothy from admixture with air. There may be a rush of air through the wound with each respiration, and the lung on the injured side collapses and goes out of action. Such wounds are readily infected causing suppuration in the chest.

The injured person should be kept at rest and the wound cleaned with an antiseptic lotion, covered with surgical dressings and bandaged. The patient should be sent to hospital as soon as possible.

Internal bleeding might be in the thorax, abdomen or pelvis. Its seriousness depends on the organ injured and the extent of the injury. Shock is always present and the patient may lose consciousness and die within a short time. If he gets over the initial shock his chances of recovery depend on the promptness and efficiency of treatment. Pending

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his removal to hospital he should be kept at absolute rest and covered with blankets, and ice-bag or cold compresses applied to the injured part. He might be given tea, coffee or hot milk but no other stimulants. If the stomach is injured nothing should be given by the mouth, but if he is thirsty a saline enema should be given.

BRUISE. A bruise is an injury of the subcutaneous tissue without any rupture of the skin. Diffused bleeding takes place under the skin which produces the characteristic discoloration, being dark purple in the beginning and changing to various shades of brown, green and yellow, before disappearing. The amount of bleeding depends, not only on the force of violence but also on the part injured, general health of the patient and the tendency to bleed. The injury may involve very superficial parts just under the skin, or muscles and other deeper tissues. In the latter case it may take three or four days to appear on the surface, or it may travel under deeper tissues and appear at a distance from the site of injury, as in the case of a blow on the scalp when the bruise appears in and around the eyelids producing what is known as a black eye. When the bleeding is in excess it collects in a cavity and forms a haematoma or blood tumour, which may get absorbed in time, leaving no signs of the injury, or a little thickening for a few days, or it may get infected and form an abscess.

The treatment for a bruise is to apply ice or cold compresses or bathing the part with cold water as soon as possible after the injury, as cold contracts the small blood vessels and helps to stop bleeding. The swelling and discoloration disappear in time without any treatment. Pain from subsequent inflammation, if present, is relieved by hot fomentations. If an abscess is formed it requires opening to drain out the pus.

BURNS AND SCALDS. A burn is caused by direct contact with fire or a heated solid substance, and a scald by a hot liquid. Burns are classified into six degrees according to the amount of injury produced. A burn of the first degree consists of mere reddening of the skin without any damage. In the second degree the most superficial layer of the skin, called the cuticle, is raised and a blister is formed. In the third degree the outer layer of the skin is destroyed and the inner sensitive part containing nerve terminals is exposed which causes much pain, but it leaves no scar or deformity after healing except a little discoloration. In the fourth degree the whole thickness of the skin is destroyed and the scar that results is thick and may cause disfigurement. In the fifth, the muscles and other tissues underlying the skin are destroyed, the healing takes a much longer time and leaves a thick scar. In the sixth, all soft parts and bones are destroyed.

Accidents from burns are very common in India, particularly among women and children, as poor and even middle class women do their cooking on an open fire or kerosene stoves placed on the ground, A primus stove on the ground, without a guard round it, is a source of danger on account of its powerful flame which on the slightest contact sets ablaze the thin flowing dress of women. The oil container of the stove is also liable to burst from over-pumping, as is often done by ignorant persons to increase the flame when the burner is partly choked. Scalds caused by hot or boiling oil are very severe on account of the higher temperature of boiling oil.

Pain is the most prominent symptom in burns and scalds, and shock is more or less always present and may be so severe as to cause death ; its intensity depends on the extent of the injury and the part of the body involved, those affecting the abdomen, chest, face and head are followed by more severe shock than those involving the limbs. The later symptoms are due to inflammation and septic infection. In closed rooms death usually takes place from asphyxia caused by the poisonous fumes. Within the first few days it is due to toxic absorption from the burnt tissues and later from exhaustion, pneumonia or some other intercurrent disease. Persons suffering from severe burns are liable to get duodenal ulceration which becomes very troublesome.

As the flames spread in an unpward direction, the first thing to do when a person's clothes catch fire is to lay him flat on the ground so as to prevent the flames spreading to the face and head. The flames could be smothered by covering him with a blanket, carpet, overcoat, or any other material that is at hand ; it could also be put out by the person rolling on the ground. Water, if available, might be used, but no time should be lost in trying to get it from a distance. After the fire has been put out the patient should be kept in the recumbent position and his clothing removed. If it is adherent to the skin it should not be removed with force but cut around the injured area and soaked with glycerin or a mild lotion until it can be removed with ease. For the burn of the first degree, washing the part with lotion and dusting it with a mixture of boric acid, oxide of zinc and starch powder are all that is necessary. Blisters, if small, should be cleaned with lotion and covered, but if large they might be punctured with a needle after it is sterilized, and the fluid allowed to escape. If it collects again or becomes purulent the skin should be removed and the raw surface treated as a wound.

Many dressings have been used in the treatment of burns, but so far few have been found to be satisfactory. A weak solution of picric acid was used for dressing the raw surface, but there is a risk of poisoning from absorption if used too freely. Tannic acid in various forms is now used and its preparations are available in convenient forms and in collapsible tubes under different trade names. Any of these might be used thinly spread on gauze or lint which is applied to the wound. For extensive burns and those on the face and head early surgical help is necessary. Severe pain may require an injection of morphine 1/8 to 1/2 a grain, alone or better combined with 1/100 grain of atropine sulphate.

DISLOCATIONS. The term dislocation is applied to a displacement of one or more bones forming a joint, caused by violence or muscular action. It may be complicated by fracture of the bone involving the joint. Congenital dislocation is occasionally met with, which most commonly involves the hip joint which very often escapes notice until the child grows up ; less frequently the shoulder or the elbow joint is affected. In young children and old persons dislocations are less common than fractures, because in the former the ends of the bones are not united to the shaft and any little violence causes a separation of the ends, while in the latter, the bones are brittle and break easily ; for this reason dislocations are mostly found in young adults, being more common in men than women.

There are certain general signs and symptoms common to all dislocations: pain, swelling and bruising of the joint and the surrounding parts, and deformity due to the displacement that can be easily detected by comparing the injured with the corresponding healthy joint on the opposite side. The normal movements of the joint are restricted or are entirely absent.

Some general rules are applicable in the treatment of all dislocations. The patient should be placed in the most comfortable position without causing any disturbance of the injured joint and no attempt made to straighten the affected limb or bring it to the normal position by force, as this will increase the pain and shock and increase the damage to the soft parts. For the reduction of a dislocation a knowledge of anatomy of the joint and of the mechanism of the dislocation is necessary as also some experience. It is therefore very advisible to obtain professional help where this is available as soon as possible. A few simple methods of reducing some of the common dislocations are described here.

In the first place the clothing of the injured person should be removed gently so as not to disturb the joint. If the upper extremity is involved, the coat, then the shirt should be slipped off, the healthy side at first. If this cannot be done without much disturbance the sleeve of the coat should be slit open at the seam. After removing the clothes, ice or a cold compress is applied to the joint to prevent further bleeding and to relieve pain. If the patient is to be transferred to hospital he should be carried in the same position and without much jolting.

Dislocation of the jaw repeatedly occurs in the same person whose ligaments have become lax. It occurs when the mouth is suddenly opened wide while yawning, laughing or taking a large bite, or when a blow is struck on the chin with the mouth open. The dislocation is usually bilateral; less frequently it is on one side, in which case the chin is pushed to the opposite side. The displaced ends of the bone can be felt in the abnormal position in front of the joint, there being a hollow in front of the opening of the ear.

The reduction of this dislocation is not difficult. You stand in front of the patient who is seated on a chair; your thumbs covered with strips of cloth or bandage are introduced into his mouth, one on each side, as far as the last molar tooth, the fingers holding each side of the jaw. With a steady pressure of the thumbs the back part of the jaw is pressed in a downward direction until the dislocated ends are free and brought down a little, the chin is then slightly elevated and the ends pushed back into the joint. A four-tailed bandage is applied to the jaw (fig. 11) for ten days to prevent the mouth being opened wide. The person whose jaw has once been dislocated should be careful and not open his mouth wide while yawning, laughing or eating.

Dislocation of the shoulder joint occurs more frequently than that of any other joint in the body on account of the shallowness of the articular cavity on the shoulder blade, the large size of the head of the arm bone, the laxity of the ligaments and the exposed position of the joint. It is brought about by a fall on the hand or elbow, when the weight of the body thrown against the shoulder forces the head through a tear in the lowest part of the ligament of the joint. The displaced head of the bone lies just below the joint, but it does not remain in that position for long, being either pushed in front or behind where it can be felt as a hard round body. A severe fall on the shoulder may result in a direct forward or backward displacement and is often accompanied by a fracture. It is not at all difficult to make out a dislocation of the shoulder. There is much pain and some shock at the time of the accident. The shoulder is flattened, which is easily noticeable when compared with the opposite side, and the displaced head can be felt in the abnormal position. The elbow sticks out from the body and cannot be made to touch the side when the hand is placed on the opposite shoulder. All movements of the joint are restricted or completely arrested.

Before attempting to reduce the dislocation the position of the head should be determined, as the manipulation varies according to its position. Though the dislocation originally is in the downward direction, the head does not remain there long, but if it is still there it is easy to push it upwards into the joint. This is done, with the patient seated in a chair, by gently pulling the arm at right angles and away from the body with one hand and pushing the head upwards into the joint with the other. When the displacement is in front the elbow is directed backwards and the head can be felt in front of the joint. To reduce it the shoulder is firmly grasped, using the right hand for the right side, the fingers placed behind to steady the shoulder blade and the thumb in front above the head to push it down. The bent elbow, held by the left hand, is slowly raised to the level of the shoulder and gently pulled away from the body to disengage the head which is steadily pushed down with the right thumb. The elbow is then circumducted, *i.e.*, moved in a circular direction from behind forward and brought down to the side of the body as the head slips into the joint cavity. In the backward dislocation similar manipulation is employed, but the elbow is circumducted in the backward direction when the head is brought down. In all the movements a firm grip and steady pull are necessary so as to stretch the muscles gradually without causing pain or further damage.

In strong muscular subjects much greater force is required to overcome the resistance of the muscles. In such cases the patient is made to lie on a mattress on the ground and the operator's bare foot is placed in his armpit and his arm pulled slowly with both the hands until the head is brought down to the level of the joint when it can be made to slip easily into its place. The arm is then bandaged to the side of the body for a fortnight or so to allow the tear in the ligament to heal. The patient should not fully extend the arm upwards or indulge in violent movements for six months. It is advisable to wear a shoulder cap constantly to prevent the recurrence of the dislocation.

Dislocation of the elbow is usually due to a fall on the hand. Three bones enter into the formation of this joint, *viz.*, the lower end of the humerus, and the upper ends of the radius and ulna, the latter two forming a separate joint with one another (fig. 9). One or both the bones may be involved in the dislocation which may be forward or backward. Much violence is needed to dislodge them, consequently there is much damage and much swelling which makes it difficult to determine the nature and extent of the injury without the help of x-rays.

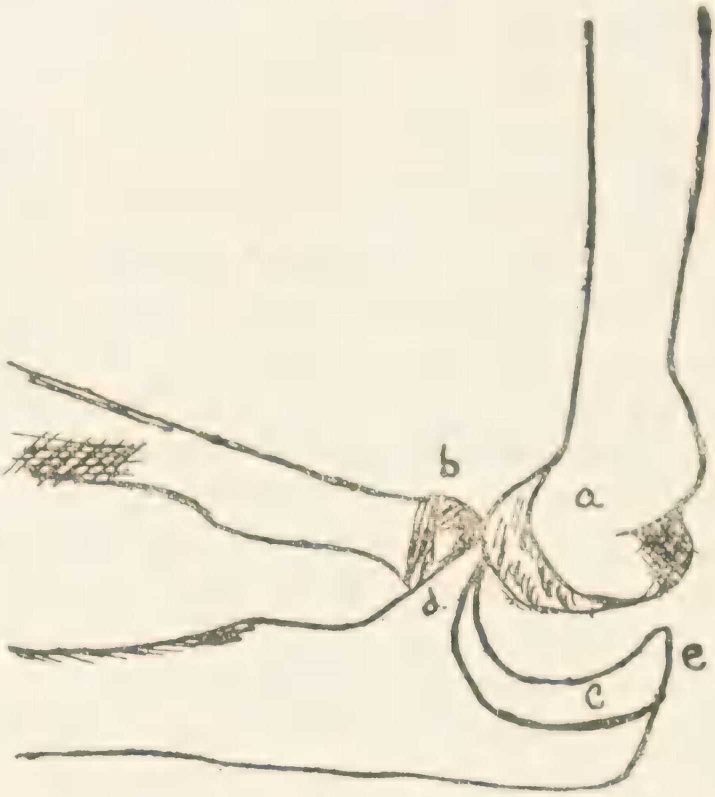

FIG. 9

The bones which form the elbow joint. a, lower end of the arm bone ; b, head of the radius ; c, articular surface of the upper end of the ulna ; d, coronoid process of the ulna ; e, olecranon process.

In the backward variety there is a projection behind the elbow which can be seen and felt. The small projection of bone on the ulna just in front of the joint known as the coronoid process, which prevents the bone to slip backwards, is sometimes broken. In such a case the dislocated bone can be reduced with ease, but it slips back again if the forearm is extended. When this projection is not broken the end of the humerus slips over it and gets locked in this position and is then more difficult to reduce. To unlock it and put it back it is necessary to stretch the muscles of the arm. This can be done by flexing the forearm by holding it near the wrist and with the other hand exerting a steady downward pressure on the elbow until the obstacle is cleared, when the dislocation can be reduced without difficulty. If this does not succeed, greater force may be applied to stretch the muscles by flexing the forearm against the operator's knee, which acts as a fulcrum, with steady pressure.

The head of the radius is liable to be dislocated forward by a forcible pull. In this abnormal position it prevents the flexion of the forearm. It can be felt in this place and rotates freely when the forearm is rotated. To reduce this dislocation the patient's arm is firmly gripped just above the elbow in such a way that the thumb is kept on the dislocated end, and with the other hand the flexed forearm is held near the wrist and steadily pulled so as to bring down the dislocated head which is guided by the thumb to its normal place. As the ligaments are badly ruptured the displacement is very liable to recur. The forearm is kept in a sling for two weeks after which it is massaged. Other dislocations complicated by fractures occur at this joint but they require expert knowledge for their treatment.

Dislocation of the wrist is not a common occurrence as the joint is well protected by ligaments and tendons, fracture being more common. The displacement can be reduced without any difficulty and requires the application of splints and massage. *Dislocation of the thumb* occasionally takes place, which can be reduced by a steady pull on the thumb until the muscles are stretched. The thumb is kept in a splint or plaster of Paris bandage for three weeks and massaged after the bandage is removed.

Dislocation of the hip joint is a serious condition, but fortunately it is a rare occurrence. It occurs in young adults, as after the age of fifty fracture at the hip joint is more common on account of the brittleness of the bones. The joint is made up of a deep round cavity in the hip bone, and the round head of the femur is enclosed in a capsular ligament and is surrounded by strong muscles which prevent dislocation ; but when it takes place they make the reduction difficult. The dislocation may be in front or behind depending upon the direction of the force and the position of the limb at the time of the accident. In the forward variety the limb is or appears to be slightly elongated, is partly flexed, abducted from the middle line and everted, i.e., rotated outwards. If the patient stands up he assumes a stooping position and if the dislocation is allowed to remain unreduced for a long time he is able to go about in that position without much pain.

In the backward variety the limb is shortened to the extent of two to four inches, is flexed and inverted so that the toes point towards the middle line. A distinct hollow can be felt in the groin on account of the absence of the head from the joint. An x-ray examination is necessary to show the nature and extent of the dislocation before attempting reduction. In an adult, on account of the size and strength of the muscles, the reduction of the dislocation of the hip is difficult. Complete relaxation of these muscles is necessary which can be produced under chloroform. The method of reduction is described here in short. The patient is placed on a mattress on the ground and chloroformed. For the forward dislocation the thigh is flexed on the abdomen, the knee is bent and with one hand the flexed leg below the knee is firmly gripped, while the other holds the ankle ; the thigh is then rotated inwards by moving the ankle outwards. In this way the head of the bone is disengaged and brought down a little, the knee is then carried in an inward direction by a circular movement which turns the head back into the socket of the joint.

For the backward dislocation the patient is placed in the same position and the flexed thigh and leg held as above, the thigh is then rotated slightly outward and circumducted outward with a circular movement which makes the head move forward to its socket. After reduction the patient is kept in bed for a fortnight during which the limb is gently moved and massaged, but all side movements should be avoided. At the end of this period he is allowed to go about in plaster round the hip to support the joint and prevent extreme movements. The plaster is removed after eight to ten weeks.

Dislocation of the knee joint is not common as it is protected by strong ligaments, but when it occurs it may be sideways, backward or forward. Apart from injury it is liable to occur from disease also. The backward dislocation is common in tubercular disease of the joint. The reduction is not difficult and is brought about by a steady pull until the muscles are relaxed when the bones can be put back into their normal position. The injury is very painful and it is necessary to chloroform the patient. The limb is kept in splints for three weeks after which he is allowed to go about with a plaster bandage.

A very common injury to the knee, which occurs in athletes indulging in violent games, is known as the *internal derangement of the knee*. The knee joint is made up of the lower end of the thigh bone, the head of the shin bone, and the patella or the kneecap which is embeded in a strong tendon in front of the joint. Two soft semi-circular cartilagenous pads are interposed between the femur and tibia, which are triangular in section, the base of the triangle being towards the periphery and the apex towards the centre of the joint. These act as cushions or shock absorbers. In all ordinary movements there is not much strain on these cartilages, but during all sudden violent movements, when the leg is twisted, one of them, usually the inner, is liable to be torn or detached from the ligament.

At the time of the accident the patient feels sudden severe and often sickening pain in the joint which becomes fixed in one position. He may be able with some manipulation to set the joint free which remains painful for some time, or it may remain locked for a day or two when all of a sudden it becomes free with a snap. The cartilage may remain displaced for a long time and has to be replaced under chloroform. The injury leaves some chronic inflammation behind and the displacement is liable to recur. After reduction it is necessary to give the limb rest for a prolonged period to allow the damage to be repaired. For this purpose the limb is enclosed in plaster for three weeks after which the patient can go about with a properly fitting knee truss. If the dislocation occurs frequently and the patient is incapacitated from work, it is advisable to have the cartilage removed by an operation.

DOG BITE. (See also Rabies Vol. II). The bite of a healthy dog is no more dangerous than a wound inflicted by any other means; but as a dog suffering from rabies may not show any typical signs of the disease, and considering the very serious risk of getting a fatal disease for which there is no treatment, it is very advisable to take all precautions as regards the wound, and undergo antirabic treatment in case there is any doubt. The dog should be kept under observation for ten days and chained and muzzled. If after ten days the dog is alive and well it is certain that it did not suffer from rabies at the time of the bite, as a rabid dog does not live so long. An animal that is usually mild and affectionate suddenly becomes sulky or begins to snap at people and bites stones and articles or furniture should be suspected and shown to a veterinary surgeon. If it dies or is killed the carcass should be sent to the nearest veterinary dispensary to have its brain examined. In the meantime the person bitten should commence taking treatment which could be discontinued if the result of the examination is negative ; it should be begun within twenty-four hours or as soon as possible after the bite.

The wound or even a scratch contaminated with the saliva should be cleaned thoroughly with soap and warm water, bathed in a strong lotion and all parts of it cauterized. The only caustic that effectively destroys the poison is nitric acid, which should be used with a glass rod in such a way as to touch all parts of the wound which is often deep and punctured. It may be necessary to open it up to the bottom to make all parts accessible to the caustic, it is then treated as an ordinary wound. This is necessary even if antirabic treatment is taken.

Some nervous persons bitten by a healthy dog sometimes develop symptoms resembling those found in hydrophobia ; the condition is known as pseudo-hydrophobia or lyssophobia, but in this true symptoms of rabies are absent.

DROWNING. The specific gravity of the human body as a whole is slightly higher than that of water, but it can float if the lungs are fully distended with air, or by a little balancing as in swimming. The specific gravity of the head is higher than that of the rest of the body ; the tendency for the head, therefore, is to hang down in water. A person can float on the surface of water if he lies on the back, extending the body at full length and throwing the head well back just keeping the mouth and nostrils above water. This position can be maintained in calm water for any length of time, provided there is no struggling or movement except occasionally pressing down the water with the palms. But a person not knowing swimming is too much frightened to think of all this and struggles to raise his head above water which causes the body to sink. In drowning, the lungs get filled with water which excludes air and causes death from asphyxia. It is not necessary in drowning for the whole body to be submerged, as accidental drowning can occur in shallow water, particularly in children and intoxicated persons who are unable to help themselves. Cases of homicidal drowning in shallow water have been on record in which children, women, or enfeebled persons have been held down by the head under water.

Death is not always due to asphyxia in drowning and may occur from heart failure or from apoplexy brought on by struggling and want of oxygen. Concussion of the brain may cause death if the head strikes a submerged rock or the side of a well while falling headlong. Provided there is continuous submersion, death takes place in about five minutes, but cases have been reported in which resuscitation has taken place after ten or even fifteen minutes and even when all signs of life have been absent. Such a thing is likely to happen if a person falling in water becomes unconscious from fright or any other reason, and is unable to breathe or admit water into the lungs. It is not possible to fix a limit of time beyond which resuscitation is not possible it is therefore advisable in every case of drowning, provided the body is not submerged for a very long period, to make prolonged efforts to revive the patient.

The first thing to do, as soon as the patient is taken out of water, is to empty the lungs as quickly as possible. In case of a child or a light person this can be done by holding him up by the legs so that the head hangs down. A heavy person can be lifted up by kneeling between his legs which are thrown over your shoulders, one on each side, and the thighs gripped firmly against your body and slowly rising from the ground. If an assistant is available he is instructed to press the patient's chest so as to hasten the process of emptying. Another method is to get a roll of bedding or some other material and put the patient face down across it in such a way as to let his head hang down on one side. While standing astride the patient on the other side, compress his chest against the bedding with both hands. As soon as the chest is emptied, turn the body face up on the bedding and quickly dry and cover him with a blanket or anything that is at hand and commence artificial respiration without any loss of time. There are many methods of artificial respiration and any one of them might be tried. The one known as Howard's method is applied when the patient is lying on the roll of bedding. While standing in the same position as before put your hands, one on each side of his chest and compress it with your weight, without using any violence so as to avoid the risk of fracturing his ribs. The compression drives out the air and when the chest is released its natural elasticity causes it to expand and draw in the air. The movements are repeated at the rate of twelve to sixteen per minute. Another method, known as Schafer's, is similar except that there is no roll of bedding under the patient and he is stretched on the ground face downwards with his forearms under the forehead so as to keep the mouth and nostrils clear of the ground, or the face may be turned to one side. Kneeling astride his hips press firmly with both hands on his back near the lower ribs as described above and then relax the pressure to allow the chest to expand. A third method is known as Sylvester's and is carried out with the patient lying on his back. Kneeling behind his head, grasp his forearms near the elbows and extend his arms above his head so that they are brought down to the ground, which helps the natural expansion of the chest, after a second bring down the arms gripped as before, on the chest and firmly press them down so as to drive out the air from the lungs, and repeat the movements as before. Another simple and less tiring method adopted by the writer is to kneel on the right side of the patient, put the right hand on the upper part of the abdomen just below the ribs and compress with the left hand the front of the chest with firm pressure ; at the same time press your right hand towards the chest. If properly done the air will escape from the lungs with a hissing sound and enter when you let go the compression. When giving artificial respiration make sure that the tongue is not fallen back in the throat to obstruct the entry of air. If it has, it should be brought out. Artificial respiration should be continued for an hour or so, as there have been cases which have been resuscitated after a long time even when all signs of life were absent. If it is going to be successful the patient will take an occasional gasping breath, but the respiration should be continued until normal regular breathing is established. If brandy, whisky or rum is available, an ounce of it diluted with two ounces of warm water might be given per rectum and repeated after an hour.

After resuscitation the patient should be kept in bed under a blanket with hot water bottles and given some hot tea, coffee, soup, or brandy and warm water. In some cases death takes place from exhaustion after resuscitation.

ELECTRIC SHOCK. A person coming in contact with a wire or rail charged with electricity becomes a part of the circuit and receives a shock, the intensity of which depends on the strength and nature of the current. A direct current, which continuously flows in the same direction, is less likely to produce a fatal result, provided the voltage does not exceed 220, which is usually employed for lighting purposes, but the danger increases with the voltage. Alternating currents, in which the flow is not in the same direction but reverses at the rate of 15 to 60 per second, may cause death with lower voltage. Those of very high voltage and very great frequency can be handled with safety, and are used in the treatment of certain diseases.

An electric shock may kill a person instantly or after a few hours. Unconsciousness and burns of varying degrees are the chief symptoms of electric shock. The severity of the burns varies from slight superficial redness to deep charring of the tissues, or there may be no external signs of any injury, especially if the clothes have been wet as the current is diffused through them.

The effect of an electric current on the muscles is to cause them to contract, so that a person touching a live wire involuntarily grips it and is unable to let it go. The first thing to do to rescue him is to free him from the current with all possible speed without getting yourself involved in the trouble. This can be done by switching off the current, but this is not always possible without the loss of much time. Before proceeding to do anything, adequate precautions should be taken to protect yourself against the shock, otherwise you will not be able to let go if you touch him. To insulate yourself from the earth, stand on some non-conducting material, such as rubber, dry silk, dry paper or a dry wooden plank. Shoes with rubber soles are safe as are also rubber gloves, but they are not likely to be available in an emergency. Several folds of dry newspaper may be used to hold the patient without directly touching any part of his body. Wet clothes or any article that is moist should be avoided as moisture is a good conductor of electricity. After freeing him put him on the back and if he does not breathe commence artificial respiration as described under drowning and continue it uninterruptedly for four hours before giving it up as hopeless. After recovery the patient should remain in bed until he is strong enough to go about. Burns are treated as described before (q.v.).

The same remarks as regards treatment are also applicable to injury from lightening. During a thunder-storm it is not advisable to take shelter under a tree, as lightening is more likely to strike a tree, and for the same reason tin sheds are not safe. Wet clothes, by diffusing the current, afford a certain amount of protection to the wearer.

FRACTURES. The breaking of a bone from violence is known as fracture. It is caused by a direct blow and the bone is broken at the spot where it is hit, or by indirect violence, when a bone, compressed between its two ends, breaks at its weakest part. It may be caused by muscular action when a powerful muscle suddenly contracts and breaks one end of a bone to which it is attached. The kneecap is very liable to this kind of accident.

Fractures are classified according to the injury inflicted on the soft parts in the vicinity of the broken ends. A *simple fracture* is one in which the bone is broken without causing any injury to the skin, organs or any other structure. A *compound fracture* is one in which the skin or the mucous membrane is broken so as to allow the broken ends to communicate with the outside air. Such a fracture is very liable to be infected retarding the union of the broken ends. A *complicated fracture* is one in which some internal organ or structure is injured by the fractured ends. A *comminuted fracture* is one in which the bone at the site of injury is broken into several pieces. An *impacted fracture* is one in which the broken ends are driven into one another. A *green-stick fracture* is one in which the continuity of the bone is not entirely interrupted (fig. 10).

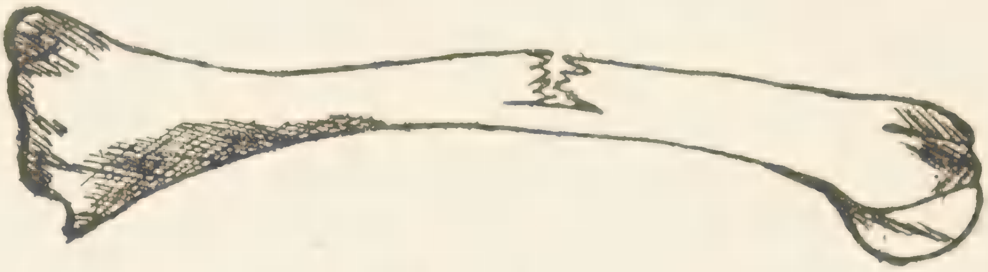

FIG. 10
Green-stick fracture of the arm-bone.

It is found in young children as on account of the softness and elasticity of the bone it gives way only on its convexity, resembling the fracture of a green twig when bent. In young persons the growing ends of bones called epiphysis, which are not firmly united to the rest of the bone, are liable to be separated ; such an accident is known as the *separation of epiphysis*.

There are certain signs and symptoms which are common to all fractures. At the time of the accident the patient feels something give way with a snap, and has severe pain with a certain amount of shock. Local signs of the injury are usually noticeable, such as swelling, effusion of blood, pain, tenderness and deformity. The swelling may be slight or it may be so great as to obliterate the normal shape of the limb. Deformity is a prominent symptom and the limb is altered in shape as the broken bone may be bent at an angle,displaced sideways, or rotated on its long axis, or it may be shortened if the ends overlap. Abnormal movements in the continuity of the bone can be felt on manipulation ; but this should not be tried unnecessarily as it is painful and likely to damage the soft tissues. A crackling sound or a grating feeling is perceived on rubbing the broken ends together which is known as crepitus. This is not felt if the ends are widely separated or are impacted. The deformity is readily noticeable if the damaged limb is compared with that on the opposite side. There are other signs peculiar to particular bones, viz. the skull, face, chest, pelvis and spine, in which deformity may not be present, or are detected with the help of x-rays.

Certain general symptoms are also present the severity of which varies according to the extent of damage and the constitution of the patient. Fever is met with in a large majority of cases, but it subsides after two or three days. Shock is present and its severity depends on the amount of damage and pain present and the treatment received by the patient. In chronic malarial subjects an acute attack of the disease is precipitated.

The union of the broken bone is brought about by nature in the same way that healing takes place in any other tissues, and the only human help that is necessary is to bring the displaced ends together and keep them there until they unite, which requires from five to seven weeks, the time being shorter in the upper than in the lower limbs. In old persons and those suffering from constitutional diseases the union is much delayed or may not take place or there may be a weak fibrous union. Normally, the fractured ends are surrounded by clotted blood and an exudation from the broken ends which becomes hard and is ultimately converted into bony tissue. It is called callus and its function is to hold the ends together. The treatment of a fracture, therefore, consists in bringing the broken ends into apposition and keeping them there to allow nature to do her work. This sounds very simple, but for properly setting the fragments and fixing the limb some knowledge of anatomy and the position of the displaced ends is necessary, and even then the matter is not very easy. Where the bone is near the surface and there is not much swelling it is easy to detect and rectify the deformity, but in the majority of cases the help of x-rays is necessary.

A patient with a fractured bone is in great pain and suffers from shock. He should, therefore, be kept at rest in as comfortable a position as possible without unnecessarily moving the injured limb. Splints could be improvised from strips of wood, split bamboo, cardboard, newspaper folded several times, walking sticks, umbrellas or any other material available on the spot. The splint should be of sufficient length so as to immobilize the joint on either side of the fracture. If deformity is noticeable an attempt should be made to correct it as soon as the patient gets over the shock. This can be done by a steady pull on the limb without causing pain or further damage to soft parts. If the deformity cannot be detected or cannot be corrected, splints should be applied to immobilize the part and arrangements made to transfer the patient to hospital where he can get suitable treatment. In case of a compound fracture where the skin or the mucous membrane is injured, the wound should be cleaned and dressed to prevent further contamination.

Before applying the temporary splint the limb should be cleaned and padded. The best material for this purpose is cotton wool, but it is not likely to be available on the spot, in which case a towel or a couple of napkins may be evenly wrapped round the limb and all bony projections protected against pressure of the splint. It is advisable to apply two splints, one on each side, for better security. The limb is firmly held between them by an assistant while the bandage is being applied. In the absence of a bandage, strips of an old bed sheet might be used or three or four handkerchiefs tied separately above and below the site of fracture. When no splint of any kind is available, the upper limb may be fixed to the side of the body and the lower one bandaged to its fellow. Whatever method or material is employed care should be taken that the circulation in the limb is not completely stopped ; for this purpose the radial artery at the wrist in case of the upper limb and the artery just behind the inner ankle in case of the lower limb should be felt after the bandage is tied. If after repeated attempts it cannot be felt the bandage should be loosened a little. If the fracture is properly set and the limb immobilized without undue compression, the pain is reduced or relieved and the patient feels more or less comfortable.

If the deformity is corrected and splints properly applied there is nothing else to do in case of a simple fracture. In old days a broken limb was kept firmly fixed in splints from five to eight weeks or for longer periods, with the result that the fracture took longer to unite and the muscles for want of use and restricted circulation atrophied ; for the same reasons the ligaments contracted and joints became stiff and painful, requiring months of tedious and painful treatment to get over the effects of the faulty treatment. The present method of treating a fracture is to remove the splint after a week or so and massage the limb morning and evening to promote circulation. After removal of the splints the upper limb is kept in a sling and the lower between two sand bags. It takes three to four months before the damaged bone is able to bear the weight of the body, but in old people the time is much longer. Broken ends, properly set and kept in place for a week or so, are not likely to be displaced provided no weight is thrown on them till the union is firm.

Ready made splints of different shapes and sizes made of wood, leather, light metal, wires or iron bars, ingeniously designed for the treatment of different fractures are now available from makers of surgical instruments. Some of these are very complicated and require skill and knowledge for their use ; but fortunately the fractures requiring the use of such splints are not common. A splint, before it is applied, should be well padded so that it may not hurt the skin or press on bony points. Soft pads evenly filled with cotton wool and slightly wider and longer than the splint should be used. The limb is washed, dried and dusted with zinc and boric powder before the splint is applied. The padded splints are firmly held on each side of the limb by an assistant and fixed to it with three or four strips of sticking plaster before the bandage is applied. Sufficient pressure is used to prevent the movement of the broken ends without constricting the blood vessels. The upper limb is then kept in a sling while the lower one is placed on a soft pillow in such way that the heel is free and does not press against the bed or the pillow, otherwise the leg is likely to be bent permanently.

SPECIAL FRACTURES

The fracture of the *nose* may involve one or both the bones forming the vault. When both bones are broken there is a deformity, the bones being displaced sideways or flattened. Bleeding from the nostrils is present but is not troublesome. When there is no deformity there is nothing to be done except to clean the nostrils with a mild antiseptic lotion and apply carbolized glycerin inside the nostrils with a soft swab. The bones, if displaced sideways, can be replaced easily, but when the bridge is flattened the deformity is difficult to rectify without professional help.

The fracture of the *upper jaw* is always due to a direct blow on the face or gunshot wound. The fracture is compound and usually involves both the sides, and as it communicates with the nasal and oral cavities, it is very liable to be infected and become troublesome. The patient has to be kept on liquid diet as he is unable to masticate, and the mouth, nose and throat are frequently cleaned with an antiseptic lotion.

The fracture of the *lower jaw* is caused by a blow in front of the chin or a fall against a hard substance. It is always compound and communicates with the oral cavity. There is bleeding from the mouth and some irregularity in the line of the lower teeth. When both sides of the bone are fractured there is a downward displacement of the front of the jaw. Much pain is caused on account of the sensitive dental nerves being injured. Septic infection of the wound is certain to take place, unless great care is taken from the beginning, which enhances the seriousness of the trouble and may cause necrosis of the bone, dangerous bleeding or subsequent pneumonia.

The lower jaw can very easily be immobilized by a four-tailed bandage which should be sufficiently wide so that it may not slip from the chin (fig. 11). The back ends are tied together a little in front of the top of the head, while the front ones are tied behind, and to prevent these loops from slipping, the ends, after the knots are tied, are brought together and tied on the top of the head. If there is no displacement of the fragments, or when they can be brought together with ease, and if the teeth are not displaced, this is all that is necessary by way of treatment except frequent cleaning of the mouth. The bandage is kept on for five weeks or until the union is complete. The patient will have to be kept on liquid diet as he is unable to masticate. Loose teeth do not necessarily require removal and unless they are knocked out of their sockets, they become firm again. It is advisable to consult a dentist and make an x-rays examination to make sure if the fragments are properly set.

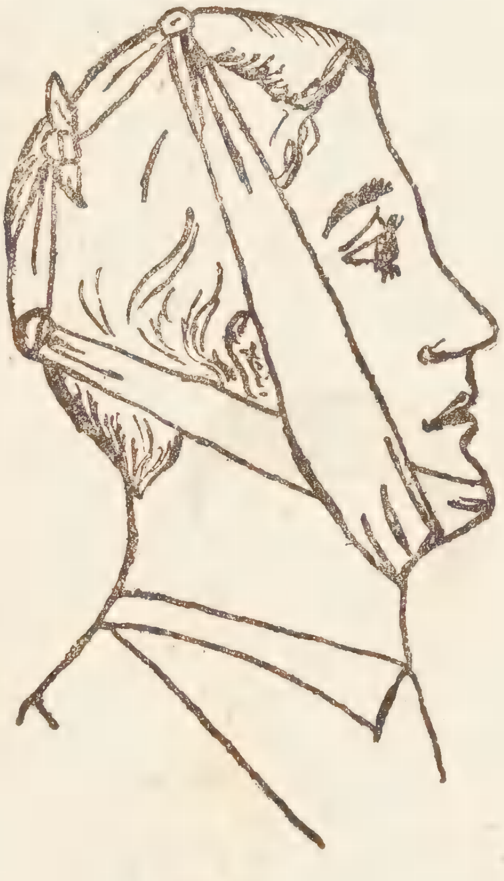

FIG. 11
Four-tailed bandage applied to the jaw.

When the displacement cannot be replaced or the bone is broken into several pieces surgical help is necessary to apply a wire splint or wire the fragments together.

The *collar bone* is one of the two bones in the body most frequently broken, the other being the radius. It is caused by a fall on the hand and is common among riders, cyclists, and runners. The bone is placed horizontally under the skin, between the tip of the shoulder and the top of the breast bone, and supports the upper extremity, so that when the body falls on the hands its weight is thrown on the bone which gives way at its weakest part. The patient is unable to use his arm and supports the elbow with the opposite hand, the head is bent towards the injured side and the point of the shoulder is lowered. The bone being just under the skin the broken ends can be felt and seen unless there is much swelling. When the fracture is near the tip of the shoulder there is little displacement. In children the fracture is of the green-stick variety.

The first aid in such cases consists in immobilizing the arm and raising the elbow by means of a triangular bandage. One end of the bandage is placed on the shoulder on the uninjured side while the other hangs down in front of the body, the apex of the bandage being behind the elbow on the injured side. The forearm is flexed and the lower end of the bandage is carried in front of it to the back of the neck over the shoulder on the injured side where it is tied with that on the other side, the elbow being raised at the same time to bring the point of the shoulder to the same level as on the other side. The apex of the bandage is pinned in front (fig. 12). To prevent jolting or movement in sleep the arm is

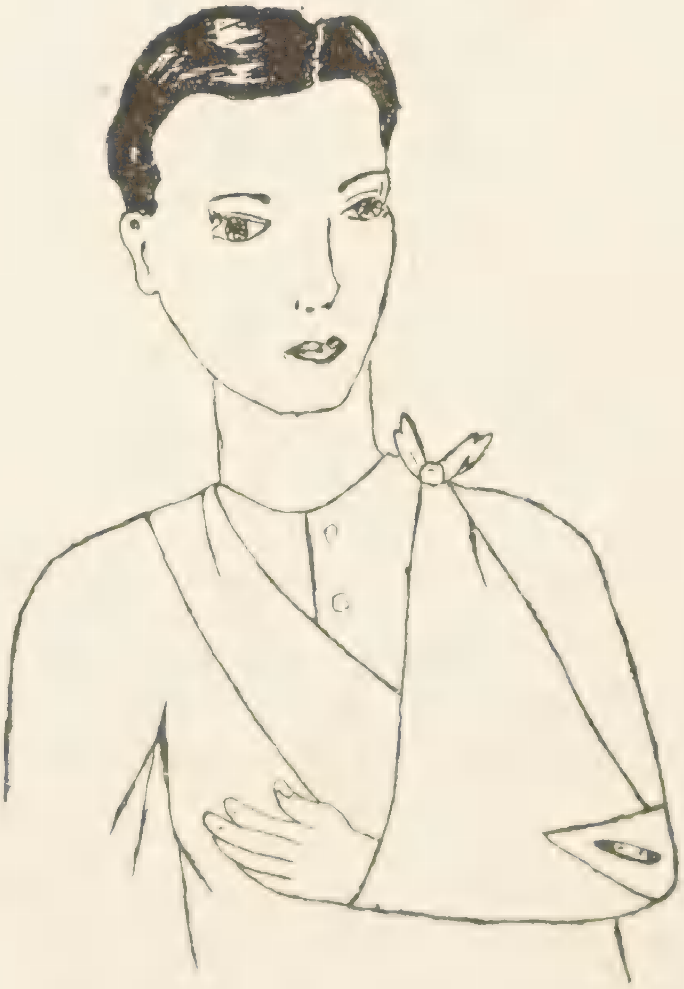

FIG. 12
Triangular bandage used as a sling for the forearm.

fixed to the side of the body by means of a broad bandage. When the fragments overlap and the shoulder is pushed to the middle line of the body, the defect can be corrected by drawing out the shoulder by the application of a figure of eight bandage, two loops of which include the shoulders and the crossing is on the back (fig. 13). The free end of a broad roller bandage is held on the back below the level of the armpit and the roll is carried to the opposite shoulder and passing in front of it is brought to the middle of the back, from where it is carried to the other shoulder and brought back in the same way, exerting firm pressure to pull the shoulder back. A few turns are sufficient to keep the shoulder fixed in this position. Soft pads might be placed in front of the shoulder to prevent the bandage hurting the skin. The forearm is supported in a sling so as to raise the elbow. Another method of pulling out the shoulder is to place a sufficiently thick and soft pad just below the armpit and firmly bandaging the arm below this as far as the elbow to the side of the body. Unless this is done carefully it is apt to press on the blood vessels and nerves causing stoppage of circulation and pain in the arm.

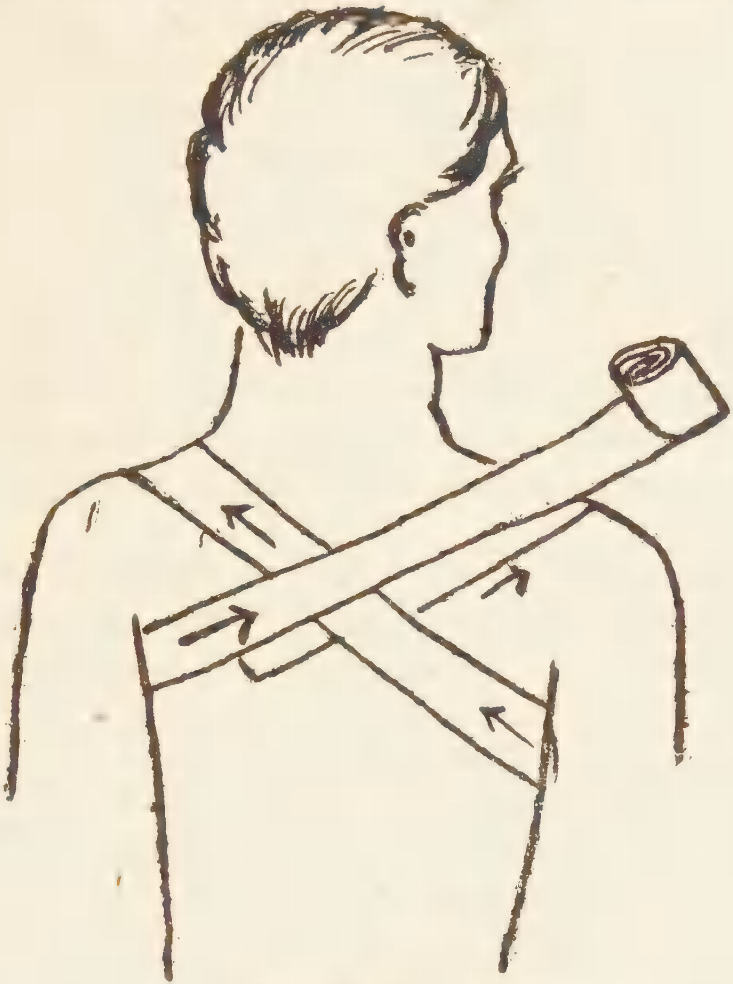

FIG. 13

Method of applying figure of eight bandage to pull shoulders back in fracture of the collar bone so as to bring the overlapping fragments into position.

The fracture of the *shoulder blade* is rare as the bone is covered with muscles, but when it occurs it is mostly due to direct injury. There is no displacement and no treatment except rest is required. The projection of the bone at the tip of the shoulder to which the outer end of the collar bone is attached, is sometimes broken. The arm hangs powerless, the shoulder is flattened and its tip lowered. The treatment consists in raising the shoulder by means of a sling and fixing the arm to the side of the body for ten days followed by massage.

The fracture of the *arm bone* may take place in any part of its length. When one of the ends is broken the fracture may involve the shoulder or the elbow joint and may leave a permanent deformity. There is much pain when the joint is affected, with a good deal of swelling. The shaft of the bone is broken by direct or indirect violence or by muscular action, e.g., when suddenly throwing a heavy body. The fracture of the lower end takes place about an inch above the elbow and it is a serious injury when the joint is involved. The lower fragment is displaced forward or backward according to the direction in which the force is applied and it can be felt in its abnormal position. The backward displacement resembles the backward dislocation of the elbow, but in the latter the relative positions of the three bony points of the elbow, viz., the tip of the elbow and the outer and inner bony projections of the lower end of the humerus known as condyles, are changed, the tip of the elbow being further away from the condyles, while in the former the relative positions of these three points are not disturbed. This can be easily determined by comparing the damaged with the healthy joint on the opposite side.

Before doing anything, ice or cold compresses should be applied for an hour or so to reduce the swelling. If the shoulder joint is damaged or the fracture is in the upper third of the bone the arm is fixed to the side of the body by a broad roller bandage and the forearm supported in a sling. In fracture of the shaft the arm is put between two splints and if there is any deformity or shortening it should be rectified by gently pulling the forearm for some time before the splints are applied. The deformity at the lower end, when the joint is not involved, can be easily rectified by holding the arm above the fractured site, pulling the forearm, which is bent at right-angles, fixing the arm between a front and a back splint and supporting the forearm in a sling. It is very important to have an x-rays examination if the fracture is near a joint so as to ascertain the extent of damage to the joint and the deformity that is present otherwise proper treatment cannot be applied.

The fracture of the *ulna* is fairly common on account of its exposed position and is very often due to a direct blow with a stick. When the upper end, which takes part in the formation of the elbow joint, is broken the fracture involves the joint also. The tip of the bone, which is felt behind the elbow, is called the olecranon process (fig. 9e), it is liable to be broken by a fall or blow on it, or sometimes by the contraction of the triceps muscle which is attached to it and which normally causes extension of the forearm. The line of fracture is usually transverse, but when due to a direct blow it is broken into small fragments. When it is transverse there is distinct gap between the fragments which can be felt and which increases when the forearm is flexed. Pain, swelling and other local signs are present. If the gap is not wide the fragments can be brought together by extending the forearm. A front splint to fix the limb in this position is applied for two weeks ; after that massage and gentle movements to prevent the joint getting stiff are continued or eight weeks.

The shaft of the bone may be broken in any part of its length and the fracture can be detected easily and the displacement of the fragments, if any, can be corrected without difficulty as the bone is superficial throughout its whole length. Even if the fragments are united at an angle no functional disability is likely to result. The forearm is fixed between two splints wider than the width of the limb so that while bandaging the broken ends are not pressed. The injury is more serious when it is accompanied with dislocation of the upper end of the radius as happens sometimes.

The tip of the bone projecting in front of the upper articular surface of ulna (coronoid process, fig. 9 d) is sometimes broken by a fall on the hand which causes a backward dislocation at the elbow. The small fragment is pulled upwards by the biceps attached to it. The forearm has to be completely flexed and fixed in that position so as to bring the broken piece to its proper place. The splint is removed after five weeks and the part massaged twice daily.

The fracture of the *radius* near the elbow joint involves the joint also. There is much pain with swelling and some deformity. The upper small fragment is displaced upwards and may be permanently fixed in that position causing stiffness of the joint. It can be set after an examination with x-rays which should be done early. The fracture of the shaft of the bone is fairly common. In what is known as "chauffer's fracture," which was very common before the introduction of self-starters in motor cars, the bone breaks in its lower half by the backward jerk of the starting handle on account of a premature explosion in the cylinder. There is much pain and the patient is unable to rotate the forearm. There is not much displacement and the fragments can be brought together by supinating the forearm which is fixed in that position for a week and kept in a sling for five weeks and massaged.

The lower end of the radius is broken near the wrist from a fall on the hand. This fracture is known as Colles' fracture, from the surgeon who first described it in detail. The deformity is very characteristic and the fracture can be diagnosed by looking at the wrist (fig. 14). The lower fragment with the hand is pushed backwards and slightly upwards. Its upper edge can be felt behind and above the wrist, while the lower end of the upper fragment projects in front and can be felt there if the displacement is considerable. A side view of the injured wrist shows this deformity clearly. The hand is also displaced towards the radial side, as the force, while falling, is transmitted mostly through the ball of the thumb. The deformity may be so slight as not to be easily noticed.

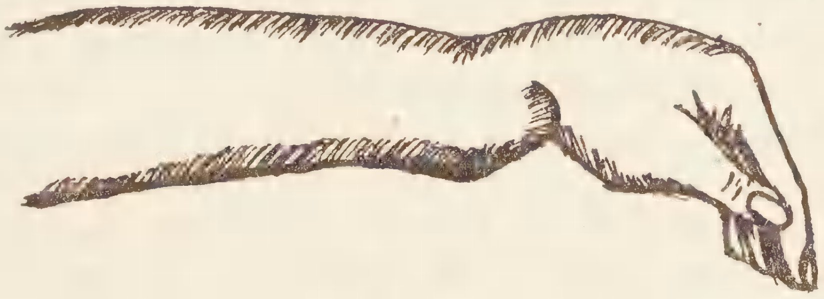

FIG. 14

Side view of forearm showing deformity produced by fracture at the wrist joint (Colles' fracture). The deformity is not always so well marked as shown here.

The displacement, if not reduced early, may become permanent and adversely affect the movements of the wrist and fingers. The broken fragments can be brought together by steadily pulling the hand, which should be done as soon as possible after the injury. If the ends are impacted it will be necessary to chloroform the patient. The forearm is fixed in a splint for a week or so and after that massaged for five weeks.

Both the bones of the forearm may be fractured by the same kind of injury as above. The fragments may overlap, be displaced sideways, or get bent at an angle. Two broad splints are applied after the deformity is corrected by gently pulling the hand and keeping the forearm straight. The splints should project beyond the margins of the forearm so that the bandage may not push the broken fragments together.

The fracture of the bones of the hand, palm and fingers is not of frequent occurance. The fingers can be fixed in suitable splints after the deformity is corrected.

The fracture of the *ribs* might take place from a direct blow, a stab wound or gunshot injury, in which case there is much damage to the lungs, pleura, liver, etc., and septic infection takes place. More frequently they are broken by indirect violence as when the chest is compressed between two hard surfaces, and sometimes as a result of artificial respiration roughly carried out. The fracture occurs at the most curved part of the ribs and most commonly involved are the four middle ribs, from the fifth to the eighth. The first two are well protected by the collar bone. There is no displacement of the fragments as the ribs are firmly held in position by the intercostal muscles and membranes, but on account of constant repiratory movements, there is much pain which is aggravated by deep breathing, coughing or sneezing.

The treatment of the simple fracture is to immobilize the chest wall on the injured side by means of strips of adhesive plaster, about three inches wide and long enough to extend three-fourths of the way round the chest. The skin is cleaned and dried before the strips are applied. The patient sits on a stool or stands with his hands extended above the head. Commencing from behind one end of the plaster is fixed a little to the healthy side of the middle line well below the level of the fracture, and the strip is carried forward slightly in an upward direction crossing the ribs and ending about three inches beyond the middle line in front. The patient is asked to exhale as much air as possible when the plaster is applied so that the chest is fixed in the position of expiration. Three other similar strips are applied in the same way each slightly overlapping the one below. The pain is relieved and the patient feels comfortable if the side of the chest is properly immobilized, provided there is no injury to the pleura or the lungs. The strips are removed after three weeks, but if the skin becomes sore they may be removed earlier and the skin cleaned and dusted with dusting powder (No. 138) before the strips are reapplied.

The patient will require immediate surgical help if the fracture is compound and contaminated with dirt or if any of the organs is damaged. The wound should be cleaned with an antiseptic lotion and covered up before the patient is moved.

The fracture of the *pelvis* is not rare and is often overlooked after an accident unless an x-rays examination is made. The pelvis is made up of three strong bones arranged in a circle, the sacrum behind and the two innominate bones in front and sides (fig. 3), and it therefore requires great force to fracture it. It is usually fractured by compression in "run over" accidents or falls from a height. The pelvic ring is broken in more than one place in such accidents and the pelvic organs, viz., the bladder, rectum, urethra, and the uterus in the female, are liable to be damaged, especially if they are distended.

There is little or no displacement when the upper part, known as the false pelvis, is involved and no special treatment is necessary, except rest in bed and sand bags on each side to keep it steady for five weeks. The lower part of the pelvis below the brim is known as true pelvis and its fracture is a more serious condition as it contains all the organs, and the weight of the body is transmitted through it to the lower extremities. Usually there is no displacement of the fragments, but shock is present and pain is aggravated on movement or attempt to get up or walk. The prognosis is very serious if any of the organs is injured unless the patient gets immediate surgical help. Bleeding from the urethra is a sign of its rupture ; inability to pass water or the passage of a small quantity of bloody urine and the presence of shock are the signs of rupture of the bladder. If such an injury is suspected the patient should be warned against any attempt to pass urine, as it will be forced into the soft tissues and produce extravasation of urine (q.v.). Bleeding from the rectum or vagina is a sign of damage to these parts.

In all cases of fracture or suspected fracture of the pelvis the patient should not be allowed to get up or walk but should be kept at rest in the recumbent position until he gets over the shock and should be sent to hospital as soon as possible, because if an organ is ruptured immediate surgical help is necessary to save his life. If no organ is damaged and there is no great displacement of the fragments the patient is kept in bed for about six weeks and is then allowed to move about with a plaster jacket and a pair of crutches until the bones are strong enough to bear the weight of the body.

The fracture of the *femur* may occur in any part of its length, usually from indirect violence. In persons over fifty the fracture of the upper end involving the neck of the bone is very common. The neck projects from the shaft at an angle and the weight of the body is transmitted through it. In old age the angle is reduced and the neck becomes more horizontal, hence more weight is thrown on it. Moreover, in old age the bone becomes thinner and more brittle and breaks with very little force. The immediate cause of the injury is a fall or jump from a low height. The fracture may be outside the hip joint or it may involve the joint also and the displacement of the fragments depends on the amount and direction of the force applied. In old and debilitated persons the prognosis as to life is very grave, because the treatment consists in keeping the patient in bed for a prolonged period in an extension apparatus, which is very liable to bring on pneumonia in such persons which is usually fatal.

The patient suffers from pain and shock after the accident and is unable to get up ; the leg on the injured side lies helpless and rotates outwards. He should be allowed to get over the shock before he is moved from the place, and the leg should be immobilized in a long splint extending from the armpit to the ankle (fig. 15). If such a splint is not available both the legs should be tied together and the patient carried in the horizontal position. As soon as the bones are united the thigh and pelvis are fixed in plaster and the patient allowed to get out of bed to reduce the risk of his getting pneumonia.

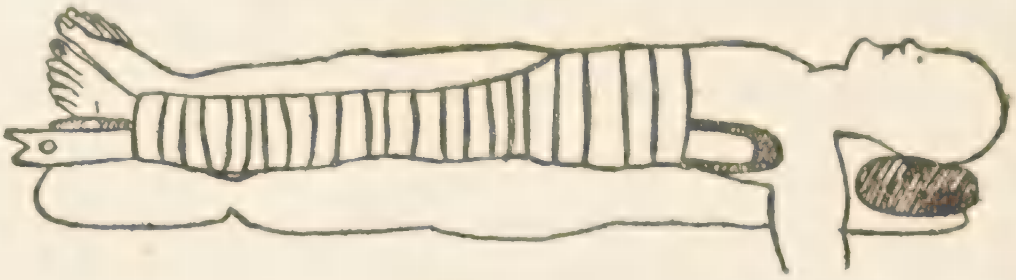

FIG. 15
Long outer splint applied for fracture of the thigh bone.

The fracture of the shaft may involve any part of its length and it is mostly due to indirect violence except when due to gunshot wounds. The fragments are usually displaced and overlap one another. On account of thick and strong muscles an extension apparatus is necessary to correct the displacement.

In fracture of the lower third of the femur the smaller lower fragment pulled back by the calf muscles attached to it (fig. 16). When the lower end is fractured the injury extends into the knee joint which is very much swollen and painful. The patient should be kept at rest and

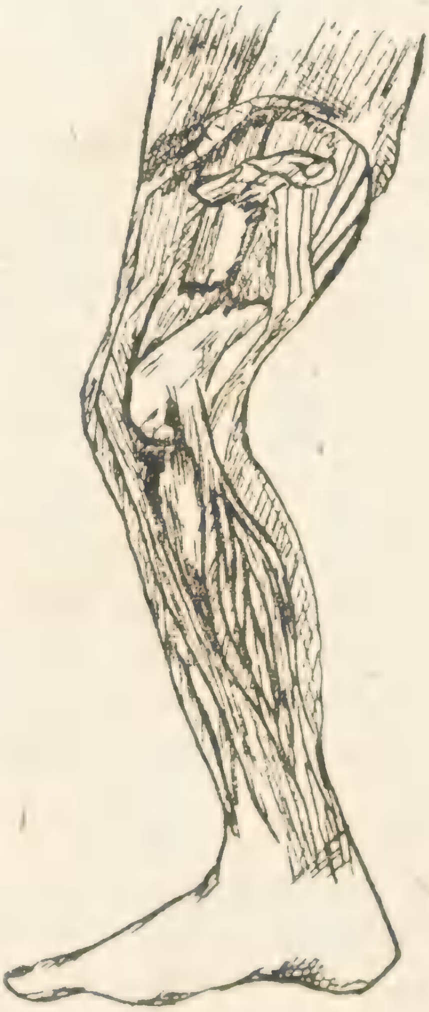

FIG. 16
Fracture of lower third of thigh bone showing displacement of the lower fragment by the action of the calf muscles.

allowed to get over the shock and there should be no movement or manipulation. Ice or cold compresses should be applied for an hour or so, and before removing the patient to hospital the limb immobilized as for the fracture of the neck of the femur. While lifting him the limb should be kept in a horizontal position and supported above and below the site of injury. The subsequent treatment depends on the nature and extent of the displacement. There are many special splints and apparatus for the treatment of this fracture and the union takes place in six to seven weeks. In young and healthy subjects the broken ends are exposed by a surgical operation and fastened together by means of metal plates and screws. This shortens the time of treatment and the patient is able to go about with crutches in four or five weeks.

The fracture of the *kneecap* results from a blow or fall on it, or it may be caused by the muscular action as happens in athletes with strong thigh muscles. When due to direct violence the bone breaks into several pieces which are held in place by the strong fibres of the tendon in which the bone is embeded. When caused by muscular action the fibres of the tendon might also be ruptured and the fragments are separated (fig. 17).

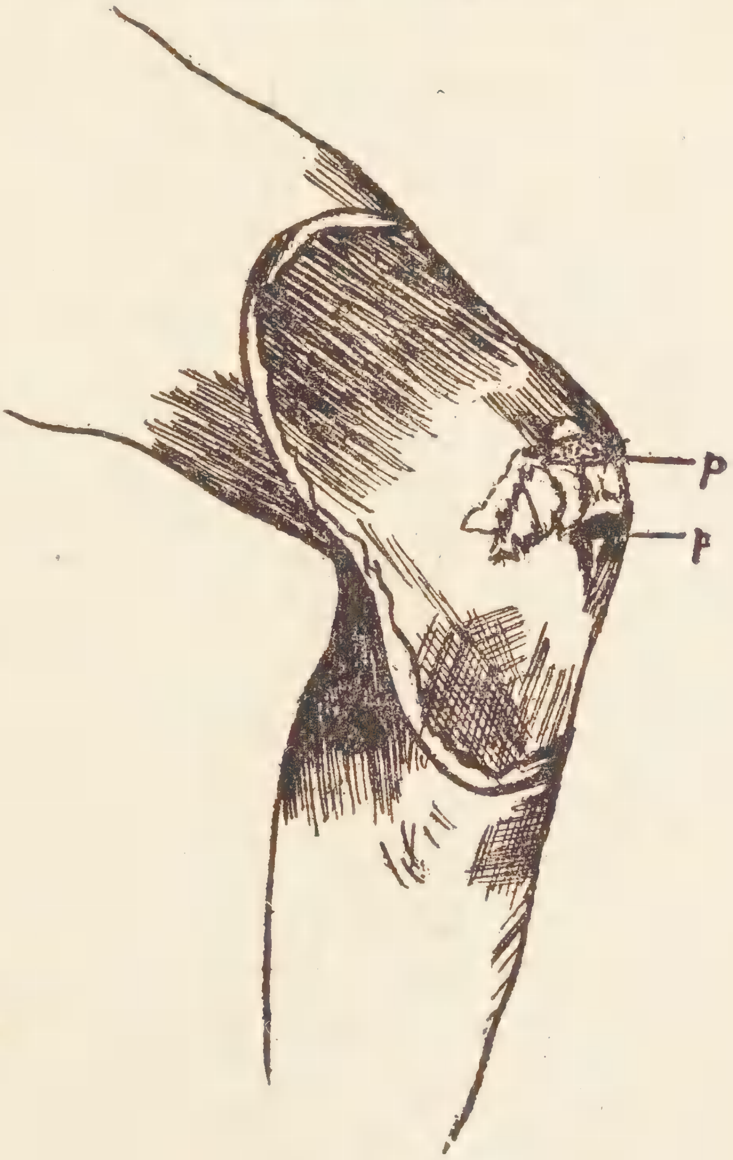

FIG. 17
Fracture of the kneecap showing the gap between the broken ends *p p.*

The gap between them can be seen and felt if there is not much swelling. Such an accident is liable to happen while suddenly trying to regain one's balance, running upstairs or climbing steep steps. Inherent weakness of the bone in some persons is responsible for this kind of fracture and there have been instances in which a similar accident has happened at a subsequent date.

The immediate treatment consists in applying ice or cold compresses to the knee which is kept at rest in an extended position so as to prevent further separation of the fragments. If there is no gap between them all that is necessary is to keep the limb between two sand bags and massage the joint twice daily and after a few days move the knee joint to prevent it getting stiff. After five weeks the patient is allowed to go about with a plaster jacket but all violent movements are to be avoided for six months. When the gap between the two pieces is small it is possible to bring them together with strips of adhesive plaster applied when the leg is fully extended. The leg is fixed on a long back splint, the knee being kept open, and a strip of adhesive plaster about three inches wide is stretched across the knee just below the lower fragment and the ends pulled up so as to bring the fragment as high as possible ; they are then fixed on each side of the splint. In the same way the upper fragment is brought down and fixed in contact with the lower (fig. 18). The fragments can also be brought together by means of a figure of eight bandage. In case the gap is very wide and the fragments cannot be brought together, they are wired together by a surgical operation as this shortens the time of treatment and is quite safe.

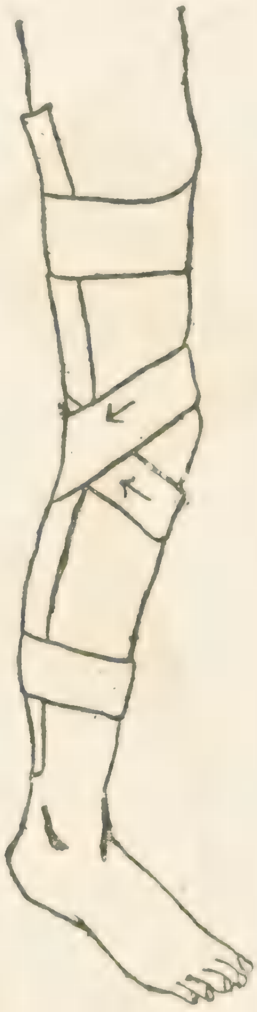

FIG. 18

Strips of plaster applied to bring the broken ends of the kneecap together.

The fracture of the *leg* may involve one or both the bones and is due to direct or indirect violence. If considerable force is applied the broken ends may pierce the skin. When only one bone is broken the other acts as a splint and prevents displacement, but when both are broken there is much deformity. The fracture of the upper end of the tibia might extend into the knee joint which gets swollen and painful. Unless prompt and proper treatment is given the joint is likely to remain stiff permanently. The fracture at the lower end is often T or Y shaped and extends into the ankle joint. Much pain, swelling and stiffness are present which make it difficult to make out the nature of the injury without the help of x-rays.

While rendering first aid, if the fracture is compound, the wound should be thoroughly cleaned and covered with clean dressings and bandaged. In simple fractures there is usually some overlapping, and an attempt should be made before applying a splint to correct this. It can be effected by a steady pull on the ankle in line with the leg while an assistant holds the thigh. The leg is kept in splints after the deformity is corrected for about ten days, after that between two sand bags and massaged regularly for five weeks longer. If the fragements cannot be got together by the above means it would be necessary to put the patient under chloroform. Special apparatus and weight and pulley are employed to bring the fragments together but the process is tedious and uncomfortable to the patient. A coumpound fracture requires very early surgical treatment and no time should be lost before obtaining it.

Fractures near the *ankle* joint are fairly common and involve the inner or the outer projection of the joint. The lower ends of the tibia and fibula project on either side below the level of the joint forming the projections of the ankle, that on the inner side being formed by the tibia and that on the outer by the fibula. The bone below them, the astragalus (talus), is wedged between the two, and below this is os calcis (calcaneus). The weight of the body is ordinarily transmitted through the middle of these bones, but when the foot slips on its inner border the astragalus is thrown forcibly against the inner surface of the outer ankle which causes the fibula to give way just above the ankle. If the force is great the ligament which binds it to tibia is also torn and if the foot is further everted the tip of the inner ankle is also pulled off or the ligament attached to it torn. A reference to fig. 19 will make it easy to understand the mechanism of this fracture.

The ankle is very much swollen and the hollows about the joint are obliterated and the foot everted. There is much pain with tenderness and the patient is unable to get up or walk. On account of the swelling it is not possible to determine the extent of the injury and displacement. Unless the position of the foot is properly restored and the fragments approximated, permanent lameness and deformity are likely to result. The foot should be kept elevated on a couple of pillows and ice or cold compresses applied to the ankle. The normal position of the foot can be restored by applying a long inner splint from the knee to an inch or so beyond the sole of the foot, covered by a thick pad which reaches the top of the broken ankle but not beyond, and firmly bandaging the foot so as to invert it over the lower edge of the pad (fig. 20). The splint is

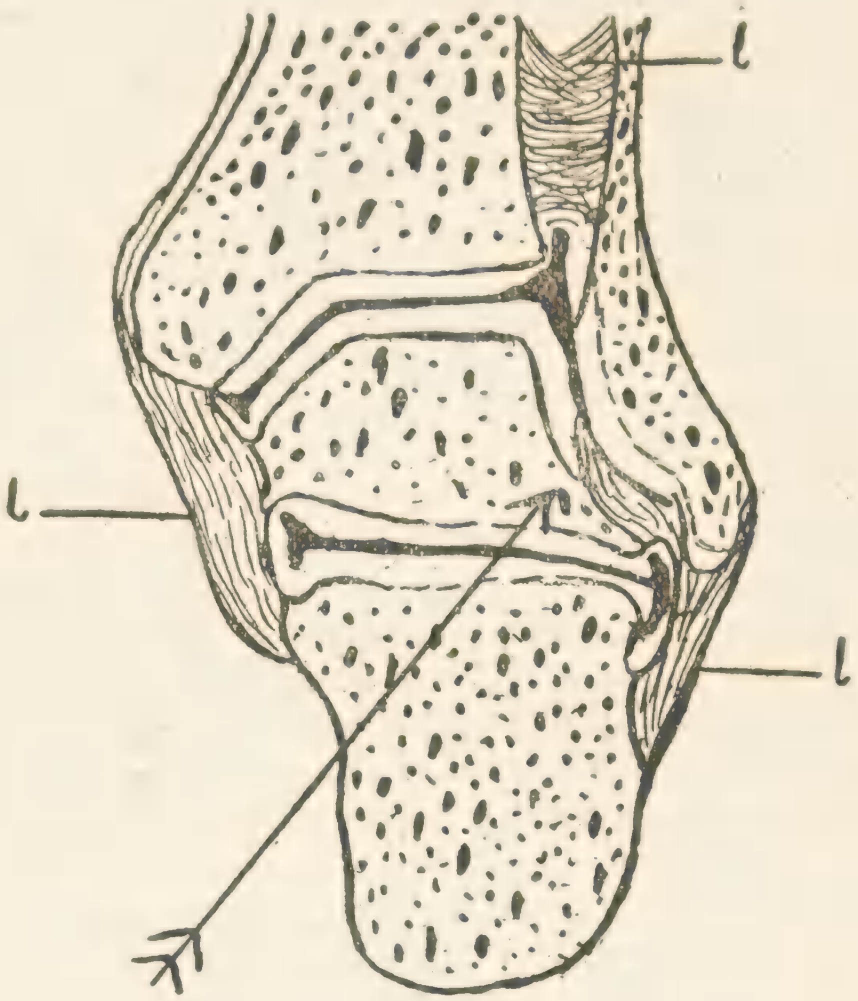

FIG. 19

Vertical section through the ankle showing the mechanism of the fracture of the ankle. *l l l* are the ligaments binding the bones together. The arrow shows the direction in which the force is transmitted when the foot slips on the inner border.

kept for a fortnight after which the displacement is not likely to recur. The leg is kept between sand bags for five weeks more and massaged twice daily. The patient should wear a strong pair of boots so as to give support to the ankle which remains weak for some time.

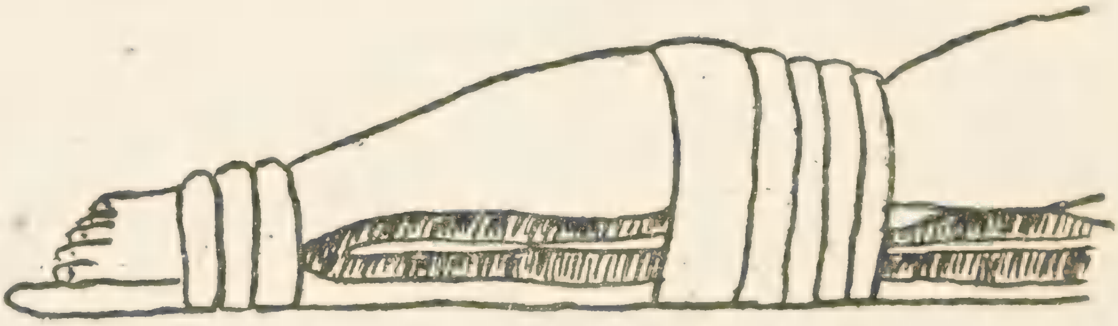

FIG. 20

Splint applied to the fracture of outer ankle (Pott's Fracture). The folded pad reaches as far as the ankle over which the everted foot is bandaged so as to restore its normal position.

A somewhat similar accident happens when the patient slips on the outer border of the foot when the inner ankle breaks and sometimes the tip of the outer ankle. An outer splint is applied with a similar pad and the foot everted over it and bandaged.

The fracture of the bones of the *foot* is due to direct violence and there is no displacement and all that is required by way of treatment is rest and massage until pain and stiffness disappear and the patient is able to walk.

The fracture of the *skull* may involve the vault or the base or both. Serious symptoms are produced even when the injury to the bone is trivial on account of the damage to the brain, and their gravity depends on the extent of injury to that organ. The usual local signs of fracture are absent.

The vault is fractured by a direct blow, fall against a hard substance or a gunshot injury ; the last, if penetrating, is fatal. It is also produced by indirect force when the skull is compressed between two hard surfaces, in which case the base is also involved. The fracture of the base is a serious condition as it is very likely to damage some of the vital and delicate structures situated there and it opens up the skull cavity into the nose, throat or ears from where septic infection may spread to the brain and its coverings. This fracture is caused by a forcible impact of the spinal column against the base of the skull, as happens when a person falls on his feet or buttocks from a height or falls headlong into a soft substance.

The symptoms are unconsciousness, concussion of the brain, shock, bleeding and escape of the cerebro-spinal fluid from the mouth, nose or ears and in severe cases escape of the brain substance from the nose or ears. The severity of the symptoms of concussion vary from slight giddiness, mental confusion, muscular weakness and momentary unconsciousness to prolonged and complete loss of consciousness or sudden death according to the extent of damage to the brain. In mild cases the patient could be roused by shouting, and the symptoms abate within a short time. He then becomes sick and may complain of headache· In more severe cases he cannot be roused for hours or days, the skin is pale and cold, breathing is shallow and sighing, pulse weak and rapid, and the temperature sub-normal in the beginning, but later it rises when inflammation of the brain or meninges sets in. There may be retention of urine and faeces or unconscious evacuation of bladder and rectum. The patient may continue in this condition for a considerable time before death.

In less severe cases favourable reaction sets in sooner or later as seen from the improvement in the pulse and breathing, return of some voluntary movements, and the ease with which he can be roused. Vomiting takes place before the return of consciousness. There is some headache, weakness and irritability for a few days. Permanent loss of sense of smell or hearing or partial loss of sight are found in some cases where the nerves are damaged. Loss of memory about the accident is common and the patient does not remember how the accident happened.

In some cases of the fracture of the skull there is compression of the brain, *i.e.*, an increase of pressure in the skull cavity which compresses the brain and causes a serious disturbance of its functions. It may be the result of bleeding within the cranium, and apart from an injury it may be due to a tumour, abscess, inflammation, or an excessive accumulation of the cerebro-spinal fluid in it. The symptoms in all these cases are identical, but in case of an injury they develop suddenly and terminate fatally within a short time unless efficient surgical treatment is available immediately. Soon after an injury to the skull the patient shows signs of concussion, from which he may regain consciousness and try to get up and walk, but this short interval of consciousness is followed by stupor and deep unconsciousness, from which he cannot be roused. He lies on the back with all muscles relaxed, with noisy breathing on account of the lips and cheeks blowing in and out with each respiration due to muscular paralysis. The pupils may be contracted or unequal, that on the injured side being dilated, the surface of the skin is moist and hot, but becomes cold towards the end, and the pulse is full and slow in the beginning, but later becomes irregular and rapid. If surgical operation is not undertaken promptly to relieve the pressure a fatal termination is certain.

In every case of injury to the skull, whether there is loss of consciousness or not, the patient should have complete rest in the recumbent position and should not be allowed to get up and walk, and should not be given any stimulants, except hot coffee or tea if he is able to swallow. He might get up after four or five days if there is no headache or giddiness. The bleeding from the nose or ears is not severe and does not require any treatment, but these cavities and the mouth should be cleaned with an antiseptic lotion and painted with carbolized glycerin. Such patients are best treated in a hospital and should be sent there as soon as possible.

The fracture of the *spine* may be partial when a part of one of the vertebrae is broken without any break in the continuity of the column, or it may be complete running through the body of a vertebra, in which case the broken ends are displaced and damage the delicate spinal cord. The incomplete fracture is due to a blow or fall against a hard projecting substance, and the complete one due to forcible flexing or bending of the spine, as when a person falls on the head or buttocks and the body is forcibly doubled up, or when a heavy weight falls on the back, the body being in a stooping position.

The human spine is a flexible column made up of thirty-three vertebrae, and the spinal cord, which consists of nerve tissues, runs downwards from the brain in the bony canal formed by their arches as far as the lumber spine where it breaks up into terminal spinal nerves. The fracture of the spine is a very serious accident on account of the injury to the cord and its permanent result.

The symptoms depend on the site of the fracture. If it is in the cervical part death takes place immediately from paralysis of vital organs. If it is in the upper part of the dorsal spine death results from paralysis of the muscles of respiration ; if the lower dorsal spine is damaged breathing is difficult and laboured and the patient does not survive long ; if it is in the lumber spine the lower part of the body is paralysed, the patient is unable to pass urine or evacuate the bowels, and lingering in bed may live for three or four years. Death in such cases is due to infection of the bladder and kidneys which results from constant catheterization to remove the urine.

The immediate symptoms are very great pain in the spine and the lower part of the body, intense shock and paralysis of the lower part of the body. Local signs of the injury are present, but it is not advisable to look for them as any slight movement is extremely painful and is likely to increase the damage to the cord. In any accident, if there is the least suspicion of damage to the spine, the patient should not be disturbed if he is unconscious or suffering from shock, as in such a state all muscles are relaxed and the injury to the cord is liable to be increased While the patient is recovering from the shock arrangements should be made to remove him to hospital. In the absence of a stretcher a broad plank, and failing that a blanket or a durrie, might be utilized. The patient is gently rolled to one side, care being taken to move the whole body together without twisting the spine, and the blanket is spread close to him ; he is then rolled back so that he lies on the blanket. He may be carried on the blanket or if a stretcher or a suitable plank is available, the blanket is placed on it with the patient and carried slowly without jolting.

The patient, who survives the immediate effects of the injury, is bedridden for life, as the damage to the cord and consequent paralysis are permanent, and affect the bladder and the rectum. In some rare cases when the cord is not damaged and the paralysis is due to a blood clot pressing on it, it is possible to relieve the symptoms by the early removal of the clot by a surgical operation, but unfortunately such cases are rare.

FROST-BITE. Frost-bite affects those parts of the body which are exposed to prolonged and intense cold, and is met with in countries with a severe winter. Intense cold freezes the tissues and deprives them of their blood supply. It abolishes all sensation including that of pain; the condition, therefore, is more likely to be noticed by onlookers than by the person himself. Persons whose vitality is lowered by physical exhaustion, hunger, insufficient food, or disease, children and old people are very liable to get it. The nose, ears, chin, fingers and toes are usually affected by it. The attack comes on insiduously, and in the beginning there is no abnormal appearance ; but soon a pale waxy patch appears on the skin which is painless. On the face and hands the skin alone is affected, but in case of fingers and toes deeper tissues are involved and unless promptly treated it results in gangrene. Though painless in the beginning it becomes very painful as soon as the part begins to thaw on account of the onset of inflammation. The early signs may not be prominent and the first thing to attract the attention is a pink or dark patch which is swollen and painful.

The preventive measures consist in maintaining vigorous circulation, taking adequate food at regular intervals, and protecting the body against cold with warm and loosely fitting clothes. As long as the circulation is maintained by exercise or movement there is not much danger from frost-bite. The rubbing of oil by way of prevention is of no use and may be harmful. Rubbing the exposed parts with the hands is useful as a preventive. Persons exposed to great cold should be on the lookout for the early signs as described above. A patch on the hands is easy to detect, but for the face a small mirror might be carried in the pocket and the face scrutinised frequently. The boots should be fairly loose and worn over two pairs of woollen socks.

Rubbing of snow or ice cold water on the affected part has been found to be useless and harmful as it is likely to damage the surface of the skin whose vitality has already been lowered. The frost-bitten part should not be exposed to sudden heat as sudden thawing is very painful and sets up severe inflammation and gangrene. The warmth and circulation are gradually restored by gently rubbing the part and the surrounding area with the hand which has been warmed in the armpit. This has to be continued for some hours. When recovery takes place there is a sensation of warmth and pins and needles and some pain in the part. It should then be covered with flannel or cotton wool and bandaged loosely, and watched frequently to see if the circulation is maintained. If in spite of all care recovery does not take place and blisters form, the part should be dusted with dry boric powder and covered loosely until surgical help is available.

HEAT EXHAUSTION Normally the heat regulating mechanism in the body adjusts itself in a healthy person under different conditions of atmospheric temperature so that the body temperature remains at a constant level. When the outside temperature is raised above the level of the body heat, or when there is an excessive production of heat in the body, the cooling mechanism comes into play and keeps the temperature at the normal level. Similarly when the atmospheric temperature is below that of the body, the production of heat is increased. But if, for any reason, this natural balancing mechanism is upset or is strained beyond its power, as when the body is subjected to excessive heat for a prolonged period, the condition known as heat exhaustion or heat-stroke results. Persons suffering from chronic malaria, alcoholic excesses, diseases of the heart, liver, or kidneys, obesity, physical exhaustion, or any other condition which lowers the vitality of the body are liable to be attacked.

The onset is sudden without any warning and the patient feels very weak, giddy, becomes pale and has a cold clammy sweat. His pulse is soft and rapid, breathing shallow and sighing, and he feels dazed and falls down, but does not lose consciousness. In rare cases there may be complete loss of consciousness and sudden death ; but as a rule the symptoms abate after a time and the patient feels better though weak and exhausted and has severe headache. He should, immediately be removed to a cool well ventilated room and put to bed. If the temperature tends to be subnormal a little brandy or 40 to 60 drops of aromatic spirit of ammonia in half a wineglassful of water might be given to him. All tight clothing should be loosened and if he is unconscious a little water dashed over his face and head. He should take rest until he feels quite well and should not again expose himself to heat for some time.

HEAT-STROKE. (Heat-hyperpyrexia). Heat-stroke is a serious condition brought on by prolonged exposure to high temperature or direct actinic rays of the sun. Persons above the age of fifty, new comers to the tropics, especially those in poor health and those who had an attack previously are very liable to get it. It may come on quite suddenly without any warning ; but as a rule, there are some preliminary symptoms which may precede the attack by a day or so. These are headache, giddiness, great thirst, drowsiness, sleeplessness, loss of appetite, disinclination for work, and irritability of the bladder. The patient has a frequent desire to pass water but the quantity passed is scanty. The attack often comes after sunset, and the first indication is restlessness or even delirious excitement which soon passes into unconsciousness, laboured breathing and coma. The temperature rises suddenly and reaches 108° or 110°, and unless steps are taken to lower it death takes place within a few hours. In some cases partial recovery under treatment is soon followed by a relapse and death. In cases that are going to recover the improvement is sudden and convalescence short. But the patient is liable to get a second or a third attack unless removed to a cool place. Impaired memory, mental weakness, and irritability are common after a severe attack.

An attack of cerebral malaria of the malignant type is likely to be mistaken for heat stroke, but in the former the preliminary symptoms are absent, the fever precedes unconsciousness and a microscopic examination of the blood shows the presence of malarial parasites in it. A chronic malarial subject is very liable to get an attack of heat-stroke and both the conditions may be present at the same time.

If the patient is seen during the preliminary stage he should be removed to a cool, quiet, and well ventilated room and placed under an electric fan or a hand-pulled punkha, and have an icebag on the head. If there is a hospital specially equipped for the treatment of such cases he should be immediately removed there. When the attack is fully developed prompt measures are necessary to bring down the fever. He should be placed on a *newar* bed without any mattress or water-proof sheeting so as to allow free access of air to all parts of the body. A couple of electric fans or ceiling punkhas with *khas* matting constantly kept wet should be employed and a spray of ice-cold water kept going to keep the room cool. Bedsheets soaked in iced water and constantly kept wet should be spread over a cradle or bamboo frame-work on the bed so as to form a cool chamber around the patient. Cold water enemata given at regular intervals are also useful. With these measures the temperature comes down steadily, but it should be watched that it does not go below 103° and as soon as it has reached this level the application of cold should be stopped and the patient wrapped in warm blankets and his body gently rubbed with a towel to induce perspiration. A small quantity of brandy or 40 minims of aromatic spirit of ammonia in half a wineglassful of warm water might be given as a stimulant. The temperature continues to fall for some time after the cold application is discontinued and if it is allowed to go below 103°, dangerous collapse is very likely to set in. In a certain proportion of cases a relapse sets in after a partial recovery, the temperature rises again, the patient passes into a state of coma and dies.

During convalescence the patient should take rest and remain quiet, not expose himself to heat and abstain from overexertion, and if possible go to a cooler place. New comers to the tropics should maintain their health, avoid alcoholic excesses, late hours, physical exertion during the hottest part of the day, and protect their eyes against the strong actinic rays of the sun by dark glasses.

SUN-TRAUMATISM. Sun-traumatism means the injury caused by the action of the actinic rays of the sun to the body. After a prolonged exposure to the sun certain unpleasant symptoms are produced in susceptible persons and those who are not used to such prolonged exposure. Usually the symptoms are mild, consisting of headache, intolerance to light and noise, and sometimes vomiting ; there may be a slight rise of temperature, particularly in children. These continue for a few hours or days and disappear without leaving any ill effects. In some few patients they are severe, continue for some days and leave behind headache, neuralgic pains, impaired memory, irritability of temper, and sleeplessness for a prolonged period. Blisters and inflammation of the skin are also liable to occur on the exposed parts of the body.

The patient should remain in a dark cool place and protect himself against the glare of the sun when going out. Headache is relieved by aspirin powder (No. 135) and a saline purge. If the attack is a severe one or occurs frequently the patient should leave the place. The susceptibility can be removed by exposure to the sun for short periods at a time, not more than three or four minutes in the beginning and gradually increased to ten without evoking any unpleasant symptoms.

POISONING. In few countries in the world are deadly poisons so readily available as in India, and many vegetable poisons, such as dhatura, nux vomica, etc., grow wild. Opium, Indian hemp and its preparations were formerly sold openly in licensed shops and any one could purchase these without a permit ; but now their sale has been placed under control. For these reasons cases of accidental, suicidal and homicidal poisoning are very frequent. Opium is mostly used for suicidal purposes, and dhatura, bhang, etc., are used in *pan supari* or smoke for stupifying and robbing travellers. Fortunately, the science of chemical analysis is so well developed that all known poisons in common use can be easily detected even when they are present in the body in very minute quantities.

Poisoning may be acute when a large dose is taken which produces sudden and violent symptoms ending in death or recovery within a short time with or without some permanent damage to the body ; or it may be chronic when small doses get into the body for a prolonged period, where they accumulate and produce gradually developing symptoms which may end in death or some permanent harm to the body.

Many potent poisons are used internally in small doses or for external application, and accidents are likely to happen from carelessness. A fatal case of quinine poisoning in a child three years old occurred some years ago through carelessness. A bottle containing sugar coated tablets of quinine, five grains each, was left on the sofa from where it was picked up by the child who started sucking the tablets, and swallowed them as soon as the quinine was exposed and tasted bitter. He must have swallowed forty-five tablets as was ascertained afterwards from the empty bottle. Cases of children eating poisonous berries or flowers growing wild are fairly common.

All poisons may be roughly divided into the following groups :—(1) Corrosives and irritants, which include mineral acids, strong alkalis, some metalic salts, and strong disinfecting fluids. (2) Non-corrosive, which may be of animal, vegetable or mineral origin, or synthetic drugs and other chemicals which may be narcotic, excitant, or visceral poisons.

(3) Infected or decomposed food, producing what is called botulism or ptomaine poisoning. (4) Mechanical irritants, such as powdered glass which is sometimes administered in food for homicidal purposes. (5) Poison gases, such as carbon monoxide, carbon dioxide, chlorine, and other gases used in warfare.

To render efficient first aid in case of poisoning it is necessary to have some knowledge of the nature of the common poisons, their effects on the body, and the antidotes for them. In every case of poisoning an attempt should be made, as far as possible, to determine the nature of the poison so as to be able to administer proper remedies. For this purpose, the empty glass or bottle from which the poison was taken should be examined and the patient's clothes, lips, tongue and mouth should be carefully observed. The smell of his breath might give some information as to the nature of the poison. All vomited matter and the contents of the bottle should be preserved for chemical analysis ; but no time should be lost before commencing treatment while these investigations are being made, as in many cases the chances of his recovery depend on the promptness with which the treatment is given.

In giving first aid the following principles should be observed :—

(1) Removal of the poison from the stomach which is still unabsorbed.
(2) Neutralizing the poison in the stomach if possible.
(3) Neutralizing the local effects on the tongue, throat, stomach, etc.
(4) Counteracting the general effects on the body.

Removal of the poison from the stomach can be effected by inducing vomiting or washing out the stomach by mechanical appliances. This is not necessary if there has been excessive vomiting from the irritant effect of the poison, and should not be tried in case of corrosive poisoning as the stomach is already much damaged and might be perforated or ruptured. Such poisons can be easily neutralized by chemical antidotes. Vomiting can be induced by (a) tickling the back of the throat with fingers or a couple of stiff feathers. This is not possible if the patient is unconscious from narcotic poisoning. A copious draught of warm water given to the patient before tickling the throat is helpful in inducing vomiting and useful in washing out the stomach. It is also useful n diluting the poison and delaying its absorption. (b) A strong solutioin of common salt, about two full tablespoonfuls in a cupful of warm water (c) A teaspoonful of powdered mustard in a cupful of water. (d) Thirty grains of sulphate of zinc in half a cupful of water. (e) Ten grains of sulphate of copper in half a cupful of water. (f) Thirty grains of carbonate of ammonia in a wineglassful of water. (g) Ipecacuanha wine, about four teaspoonfuls in a wineglass of water. (h) One to two grains of tartar emetic, known as double tartrate of potassium and antimony, in half a cup of water. (i) A hypodermic injection of 1/10th of a grain of apomorphine hydrochloride if the patient is unable to swallow. The last four or five of these are not likely to be readily available in an emergency.

The mechanical means employed to empty the stomach are the stomach pump and the stomach tube. These may not be available in an emergency and require some skill in their use. Moreover they are not to be used in case of corrosive poisoning. The stomach tube is an elastic rubber tubing with a stiff wall and a smooth rounded end (fig. 21), to the other end of which a funnel is attached. The patient sits in a chair, or, if in bed, is turned to one side, the tube is lubricated with glycerin or some vegetable oil and the free end directed to the back of the throat along the back of the tongue, guided by the first two fingers of the left hand. There may be some retching or straining by the patient when the end touches the throat, but it soon stops as the tube is gently pushed down into the gullet along the back of the throat. It takes about eighteen inches to reach the stomach, but a further three inches are allowed so as to make the end reach the bottom of the stomach The outer end with the funnel is then raised above the level of the mouth and about a pint of warm water is slowly poured through the funnel. Before the last part of the fluid flows down, the funnel is rapidly lowered below the level of the patient's stomach and inverted, this will start a flow in the reverse direction, viz., from the stomach outward. The fluid which comes out should be collected in a clean vessel for examination and analysis. The washing should be continued four or five times or until clear fluid comes out. After this some warm milk, coffee or the white of an egg mixed with water might be introduced into the stomach before the tube is withdrawn. Chemical or other antidotes might also be introduced through the tube before washing out the stomach. If a hospital is not far or medical help available, no time should be lost in giving the patient amateur treatment, except in case of corrosive poisons when chemical antidotes might be given before he is removed.

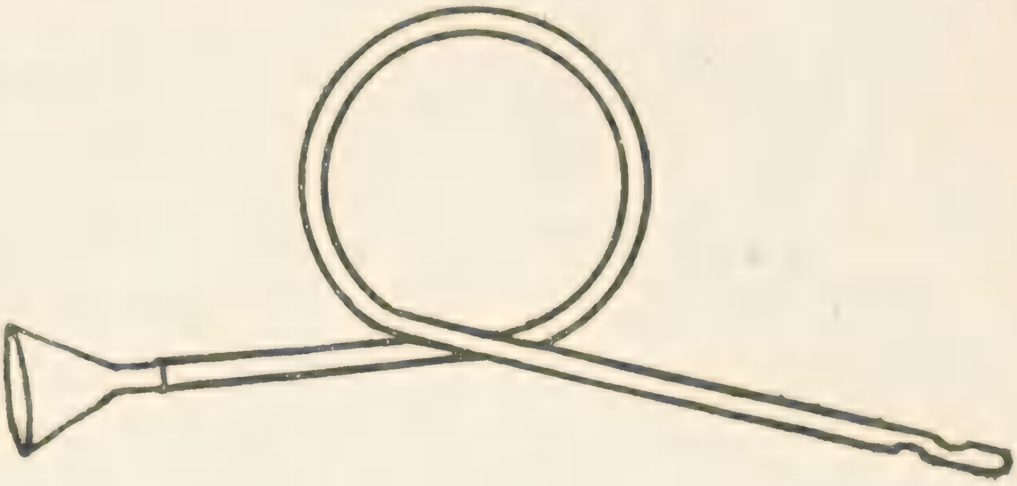

FIG. 21
Stomach Tube.

Corrosive Poisons. These produce burns, corrosion, and severe inflammation of the tissues with which they come in contact. They are strong mineral acids, such as sulphuric (vitriol or oil of vitriol), nitric (aqua fortis), muriatic (hydrochloric or spirit of salt) and hydrofluoric acids; some organic acids, such as oxalic, glacial acetic, and carbolic acids; many concentrated disinfecting fluids; caustic alkalis and concentrated alkali carbonates; some metallic salts; phosphorus; iodine; blistering fluid, etc. Many of these are used medicinally in small diluted doses.

Corrosive Acids. Mineral acids are extensively used in industry and poisoning through accidental swallowing occurs occasionally. The corrosive action of carbolic acid and other disinfecting fluids is less severe than mineral acids. The local symptoms of all the corrosives are more or less the same, the severity of which, and of the general disturbance depend on the amount swallowed and the degree of concentration. These, are pain, burning and dryness of the mouth and throat, intense thirst, nausea, vomiting with or without blood, pain in the stomach, difficulty of breathing, speaking and swallowing, shock and collapse. Death may take place within a short time from shock or it may be delayed for twenty-four hours or longer when it is due to exhaustion or perforation of the stomach.

Strong sulphuric acid chars wood and leaves a moist dark spot on it, it destroys cotton fabrics and produces a dark brown stain round the burnt spot. Spots of the same colour may be found in the mouth and other parts of the body touched by it. Nitric and hydrochloric acids produce greyish spots on the mucous membrane, which turn yellowish brown after a time. Carbolic acid leaves white stains and gives off its characteristic smell which is present in the breath also. Undiluted carbolic acid is met with as white colourless crystals which become red on exposure to air. A two per cent solution of it is used in surgical practice as an antiseptic lotion. Its prolonged application to a wound even in a diluted form is likely to produce poisoning as it readily gets absorbed into the system. Oxalic acid is used for cleaning straw, leather, etc., and for polishing metals. It is found in the shape of small pointed crystals which resemble those of magnesium sulphate, for which it might be mistaken with fatal results. Acetic acid has a strong characteristic odour and it is present in vinegar in a diluted form.

As for treatment in corrosive acid poisoning, the first thing to do is to neutralize the acid in the stomach. This can be done by administering dilute alkali salts, such as oxide or carbonate of magnesia, carbonate or bicarbonate of sodium, powdered chalk mixed with water, or lime water. If none of these is available, the scrapings from the plaster or limewash of a wall should be given with plenty of water. The use of the stomach tube is contraindicated. Milk, the white of an egg mixed with water, or other demulcent drinks may be given in moderate quantities to the patient to drink. Shock will require rest in a warm bed and stimulants might be given per rectum. If the patient gets over the earlier symptoms and shock he will require prolonged treatment for the damage to the tongue, throat and stomach.

The best chemical antidote for oxalic acid is carbonate of calcium or lime water, as the resulting oxalate of calcium is inert being insoluble. The oxalates of sodium and potassium are soluble in water and get absorbed from the stomach. Sodium and potassium salts should, therefore, not be given, unless ready means are available to empty the stomach soon after their administration, and when calcium salt is not available.

Carbolic acid has a mild corrosive action ; the use of the stomach tube may, therefore be resorted to if one is handy, after the chemical antidote has been administered, which is one of the soluble sulphates, such as sulphate of magnesium or of sodium. An ounce of either, dissolved in water, is to be introduced into the stomach and the contents emptied through the stomach tube and the stomach washed out several times. The same line of treatment is to be adopted for lysol, cresol or other poisons viz., to dilute the fluid in the stomach with copious draughts of water, and vomiting.

Corrosive Alkalis. These are caustic soda and potash, strong solution of ammonia and their carbonates. These are extensively used in arts and industry and cases of accidental poisoning from these occasionally occur. In concentrated forms they act as corrosive poisons, and the symptoms produced are the same as are found in corrosive acids, with strong diarrhoea which is frequently present in alkali poisoning. The vomited matter is sticky and slimy and may contain dark brown blood. The treatment consists in neutralizing the alkali with diluted organic acids, such as citric, acetic, etc., diluted vinegar or lemon juice, if handy, and the stomach washed out. The stomach tube should not be used if a strong alkali is swallowed. Pain, shock, etc., are treated on general lines as described above.

Liquid ammonia has a very strong smell and acts in the same way as a caustic alkali. It is used internally in medicine in small and diluted doses, and in liniments for external application. The treatment is the same as for corrosive alkalis.

Metallic Salts. Salts of many metals are corrosive or irritant poisons according to the concentration, and produce, in addition to the local symptoms, their specific poisonous effects on the system and cause death if absorbed in sufficient quantity. The most common of these are the salts of aluminium, arsenic, antimony, barium, copper, lead, mercury, silver and zinc.

Aluminium. The most easily available salt of aluminium is alum, which is a double sulphate of potassium or ammonium and aluminium. It is used in taxidermy, calico printing, in baking powder, and water purification. In a concentrated form it is an irritant poison. The treatment is the same as for corrosive poisons.

Arsenic. Arsenic and its various compounds are available in the bazar, and are present in many vermin killers, weed destroyers, wood preservatives, depilatory powders, preparations used in taxidermy, and many pigments. Arsenic is tasteless and colourless, hence accidental and homicidal cases of poisoning from it are common. It is one of the poisons whose presence can be very easily detected by chemical analysis even when found in minute traces long after death in a completely disintegrated body as it persists in the hair, nails and bones. The symptoms of acute arsenic poisoning are the same as are found in corrosive poisons with severe and persistent vomiting, purging and burning pain in the stomach. Death may take place from shock and sudden collapse. Vomiting should not be checked but encouraged by large draughts of water. The chemical antidote for arsenic is freshly prepared ferric oxide, which is prepared by adding a solution of ammonia or of potassium carbonate to tincture of perchloride of iron ; the ferric oxide which is precipitated is strained, mixed with water and given internally. Calcined magnesia is also an antidote and may be given with water ; but these chemicals are not likely to be available immediately in an emergency.

Antimony. Antimony potassium tartrate (tartar emetic) and the wine of antimony are used in medicine in small doses, and chloride of antimony (butter of antimony) is used as a browning liquid. Antimony is used for glazing cheap enamel-ware and cases of poisoning, both acute and chronic, have occurred from keeping or preparing pickles or other acid food in such vessels. In India it is used for making collyrium for the eyes, though it does not possess any special virtue and many a child has been blinded by its use. In acute poisoning vomiting is severe and no particular measures are necessary to empty the stomach, except in poisoning from antimony chloride. After the stomach is emptied and washed, a drachm of tannic acid in half a cupful of water is given. In its absence strong decoctions of tea, coffee or pomegranate bark might be given. Linseed tea, milk, or the white of an egg in water might be given and stimulants per rectum if there is shock or collapse. Persistent vomiting is relieved by mustard plaster on the pit of the stomach or sucking ice, and pain may require sedatives.

Barium. All salts of barium, except the sulphate, are poisonous. The sulphate was at one time much used for the examination of the stomach with x-rays, being impervious to the rays, but has now been replaced by other chemicals. The carbonate and chloride are used as rat poisons and in fireworks for producing green light. Many depilatory powders contain the sulphide which is very poisonous. The same symptoms, as are found in irritant poisons, are produced by barium salts and the same treatment is required. Sulphate of sodium is a chemical antidote and is given in half ounce doses well dissolved in water.

Copper. The two most commonly known salts of copper are the sulphate or blue vitriol and subacetate or verdigris. They are used in preserved vegetables to give them a permanent rich green colour and poisoning has occurred from this source. Another common source is untinned copper cooking vessels in which acid or oily food is cooked and allowed to remain for some time. Sulphate of copper is used in surgical practice as a caustic and is given internally for producing vomiting. If taken in a concentrated form the vomited matter contains dark brown blood and is of a green colour. Egg albumen, warm milk, tea or coffee may be given when the stomach is emptied.

Lead. The metal and its salts are used for domestic purposes and in industry, and cases of acute and chronic poisoning are fairly common. The acetate or sugar of lead is met with in small white crystals and has been swallowed in mistake for sugar. The glaze of some earthern vessels contains salts of lead, and acid or oily food kept in them is liable to be contaminated. The yellow and red oxides and white lead are extensively used in paints, and chronic poisoning is fairly common among painters who handle paints containing lead salts. The metal also, if handled for prolonged periods, as is done by type founders, compositors, plumbers and others, produces chronic poisoning as very fine particles of it get absorbed through the unbroken skin. Water conveyed through lead pipes is likely to dissolve it under certain circumstances and chronic poisoning is likely to occur among those who drink it. In poisoning from lead vomiting is not always present and constipation is the rule, especially in chronic cases in which colicky pains in the abdomen, cramp in the muscles of the extremities, paralysis of the extensor muscles of the forearm, a blue line along the margin of the gums, and in females frequent abortions, occur.

As vomiting is not present in acute poisoning the stomach has to be emptied by emetics or the stomach tube. An ounce of sulphate of magnesium dissolved in a tumblerful of water should be given after the stomach is emptied. It is a chemical antidote and acts as a purgative and removes any lead that might have remained in the stomach.

Mercury. Metalic mercury when swallowed may not produce any serious symptoms except salivation, colic and diarrhoea. In finely divided form it readily gets absorbed through the skin, or the lungs if inhaled in the form of vapour. It is used in the manufacture of mirrors, thermometers, barometers, etc., and for extracting gold from quartz. Formerly it was the only drug used in the treatment of syphilis, but it has now been superseded by more potent and less injurious remedies. Blue pill, which is used as a purgative, contains the metal in a finely divided state. Calomel (sub-chloride of mercury) is also used as a purgative to relieve the congestion of the liver, and the corrosive sublimate (perchloride of mercury), which is a deadly poison, is used in 1 in 1000 dilution as a strong antiseptic lotion. It is also used in photography. Cyanide of mercury is a potent and rapidly acting poison.

In addition to other symptoms of corrosive poisoning, diarrhoea with very painful straining and mucus and blood is present in mercurial poisoning. Salivation and inflammation of the gums are common in chronic poisoning. By way of treatment, after the stomach is emptied, egg albumen is given freely as it combines with mercury and forms an insoluble albuminate of mercury. Abdominal pain and straining are relieved by a few drops of laudanum. Carbonate of magnesia is useful in emptying the stomach and soothing the alimentary tract.

Silver. Nitrate of silver is a corrosive and is used as a caustic, and accidental poisoning has occured from swallowing it. The chemical antidote for it is common salt which precipitates it as insoluble chloride of silver.

Zinc. The sulphate and chloride of zinc are the two salts which have caused accidental poisoning. The former resembles magnesium sulphate and has been taken in mistake for it. It is used as an emetic in small doses diluted with water. Other salts of zinc are used in medicine in minute doses. After emptying the stomach an ounce of carbonate of sodium is given dissolved in plenty of water.

Poisons of Vegetable Origin. There are many varieties of poisonous plants which grow wild in India and which are so easily accessible to everyone that cases of accidental, suicidal and homicidal poisoning are fairly common. Plants contain an active substance known as *alkaloid;* some of the alkaloids are solid while others are liquid. Many of these are extracted, purified and used in minute doses in medicine. They are classified according to their action on the body, as stimulants, depressants or narcotics, and according to their action on special tissues or organs. Some alkaloids are prepared synthetically in the laboratory. They are readily absorbed from the stomach and from the unbroken skin if used in a solution. Their presence in the body even in very minute quantities can be detected by chemical analysis of some of the organs, saliva, sweat, urine, and vomited matter. The same principles apply in the treatment of poisoning from these as for other poisons, viz., to empty the stomach as soon as possible, administer chemical and physiological antidotes and counteract their effects on the body. Some of the more common poisons of vegetable origin are described here.

Aconite. It is also known as monkshood, blue rocket or wolfsbane, its Indian name being *bish* or *bachnak.* It is a shrub from two to four feet high and is grown in gardens for its showy flowers. All parts of the plant are poisonous. It is used in medicine internally in minute doses and for external application. In Indian medicine it is used as a diaphoretic and anodyne in acute inflammatory conditions ; its finely powdered roots are used as an insecticide. Accidental poisoning frequently occurs in children from sucking the flowers. Its root, which has some resemblance to horse-raddish, is eaten in mistake with serious results. The symptoms produced by it are a sensation of tingling and warmth in the tongue which spreads to the throat and stomach and to all parts of the body, giddiness, restlessness, weakness and tremors in the limbs, and finally paralysis, collapse and death. The stomach should be emptied as soon as possible and stimulants, such as brandy, tea, coffee, etc., administered and the patient kept warm in bed. Artificial respiration may be necessary in case of respiratory failure.

Arum Maculatum. There are many species of this plant, all of which are poisonous. It is also known as "lords and ladies". Accidental poisoning in children has occurred from chewing the leaves or swallowing the berries. The roots are also poisonous if eaten raw, but when well boiled they are innocuous. The symptoms are vomiting, abdominal pain, swelling of the tongue and throat, salivation and collapse.

Belladonna. It is populalrly known as deadly nightshade. It is a perennial shrub and grows in many parts of Europe, Asia, America, and India. It has dark purple bell-shaped flowers and large black berries which resemble cherries, but have a fetid odour and a bitter unpleasant taste. The alkaloid obtained from belladonna is known as atropine which is used in medicine in minute doses. Tincture, extract and liniment made from the plant are also used. The symptoms produced by a poisonous dose are flushing of the face, a sensation of burning and dryness in the mouth and throat, difficulty of swallowing, dilated pupils, disturbance of vision and hearing, dryness of the skin, giddiness, headache, mental confusion, and unconsciousness. Death may take place within a few hours or after five or six days. Morphine is the antidote for it and is administered in $\frac{1}{8}$ to $\frac{1}{2}$ grain doses according to the age and physical condition of the patient. Laudanum in 10 minim doses might be given in the absence of morphine.

Buttercups. These are ornamental flowers and are cultivated in gardens. The shrub exudes an acrid irritating fluid which when applied to the skin causes burning and blisters. All parts of the plant are poisonous and when swallowed produce pain in the stomach, vomiting, diarrhoea, and collapse.

Calabar Beans or Ordeal Beans. These are dark, oval, hard, leguminous beans which grow on woody creepers indigenous in India, West

Africa, and Brazil. They are known as ordeal beans, because a person suspected of magic and witchcraft in West Africa is made to eat them to prove his innocence. The active principle obtained from it is known as physostigmine or eserine which is used in ophthalmic practice for producing contraction of the pupil. The symptoms are great thirst, giddiness, cramps in the limbs, contracted pupils, difficulty of breathing, collapse and unconsciousness. The physiological antidote for it is belladonna or atropine. Sulphate of atropine 1/100th of a grain by hypodermic injection, or 5 to 15 minims of tincture of belladonna by the mouth are given after the stomach is emptied.

Calotropis or Gigantic Swallow Wort. Its Indian name is *madar* or *akro.* It is a shrub 8 to 12 feet high which grows wild in India. It yields an irritating milky fluid from the leaves, flowers and stalks which is used as a counter-irritant in chronic joint affections. The leaves are large and oval and the flowers star-shaped and pink or purple in colour. The dried juice and powdered roots are used in Indian medicine and criminally for procuring abortion, but its action is very uncertain and attended with danger to life, many fatal cases having occurred from its use as an abortifacient. It causes severe abdominal pain, vomiting, diarrhoea, cramps, and collapse. There is no antidote for it and the treatment is carried out on general lines.

Cannabis Indica or Indian Hemp. This is a small annual shrub cultivated in India, Iran, and Afghanistan, and is much used in eastern countries as an intoxicant. It is available as *bhang*, consisting of dried powdered leaves ; *ganja*, which is the dried flowering and fruiting tops from which the resin is not removed ; and *charas* which is the dried resin. All these are used by addicts. Preparations of the Indian hemp are used in medicine as an anodyne, antispasmodic and hypnotic in certain conditions. In Indian medicine it is used as an appetiser, aphrodisiac and anodyne. It is given to horses as a tonic. In small doses it acts as an agreeable stimulant, increases appetite, exhilarates and excites the imagination, and temporarily improves the sight and hearing. But very soon these effects are followed by depression, drowsiness and hypnosis. A large dose shortens the initial state of excitement or does away with it entirely and produces numbness and weakness in the limbs, loss of sensation and stupor. Its prolonged use, even in minute doses, causes tremors and weakness of muscles, bloated face, defective memory, and imbecility or maniacal insanity. The addicts are liable to suffer from hallucinations and fits of depression and excitement and may develop a sudden homicidal tendency as a result of which they run amok and attack people indiscriminately. Indian hemp is administered for criminal purposes in smoke or sweets by robbers to stupify their victims. The treatment consists in administering stimulants after emptying the stomach and giving artificial respiration if the breathing stops.

Castor Oil Seeds. These are produced on a shrub about eight feet high, which grows in India, America, and the southern parts of Italy. The cold drawn oil from the seeds is used as a purgative, while the hot drawn is used for lubricating machinery. The seeds contain a poisonous substance and accidental poisoning occurs sometimes in children from swallowing them. The symptoms are violent vomiting, purging, colic, cramps, and collapse. To relieve the pain a few drops of laudanum may be necessary after the stomach is emptied.

Cerbera Thevetia. This is a shrub about eight feet high which grows in India, its vernacular name being *pila kaner.* It produces yellow bell-shaped flowers and green globular fruit containing two seeds. All parts of the plant are poisonous. The powdered seeds are used for poisoning cattle. It produces vomiting, purging, colic, and collapse.

Cocaine. It is an alkaloid obtained from the leaves of the coca plant which is a shrub growing in India, Ceylon, Java, and South America. It is used in surgery, and ophthalmic and dental practices as a local anaesthetic. Cocaine eating has become a habit in many countries, and in India, although its sale has been under control, small packets containing a few grains of it are sold surreptitiously. It is eaten in betel leaves in India, while in America it is used as snuff. It is one of the drugs used for doping race horses. It is a habit-forming drug and even a single dose taken out of idle curiosity may become the beginning of a lifelong habit. The alkaloid taken by the mouth or chewing the leaves produces a mild bitter taste followed by tingling and numbness in the tongue and lips. There is an initial stage of stimulation and excitement with a feeling of exultation and muscular strength. This stage is short if the dose is large or is frequently repeated ; it is followed by depression, weakness, giddiness, profuse perspiration, difficulty of swallowing, disturbance of sight and hearing, numbness and cramps in the limbs, and paralysis. Death takes place within a few hours from stoppage of respiration or heart failure.

The symptoms of chronic poisoning from small repeated doses as found in addicts are mental dullness and confusion, weak memory, sleeplessness, loss of appetite, diarrhoea and a dull expressionless appearance. Eyesight and hearing are dulled. In acute poisoning the stomach will have to be emptied by mechanical means as on account of loss of sensation vomiting cannot be induced. Stimulants and artificial respiration are necessary if breathing shows signs of failure. For chronic poisoning in adults the drug should be stopped completely and measures adopted for the improvement of health. Sudden and complete stoppage of the drug does not produce any ill effects on the health, though there is some restlessness for the first two or three days during which the craving is very great.

Colocynth. Colocynth used in medicine is prepared from the pulp of the fruit of a creeper known as *citrullus colocynthis*, its Indian name being *indrayan.* It grows in many Asiatic countries, Africa, and the south of Spain. The fruit is about the size of a small orange, yellowish green or brown when ripe and has a bitter unpleasant taste. The pulp is whitish and spongy from which medicinal preparations are made which are used when a powerful and rapidly acting purgative is required. All parts of the plant are poisonous and act as a powerful gastro-intestinal irritant in the same way as croton oil. Criminally the pulp and the seeds are used by quacks for producing abortion, but its action as an abortifacient is uncertain and dangerous. The treatment is the same as for croton seed poisoning.

Croton Seeds. They are also known as purging nuts and their Indian name is *jamalgoto*. The plant is found in India, China, and other eastern countries. The seeds, from which the oil is obtained, resemble castor oil seeds. The oil extracted from them is clear yellowish or reddish brown and is a violent and rapidly acting purgative. It is used in medicine in $\frac{1}{2}$ to 1 minim doses when a purgative is required for an unconscious person its minute dose being an advantage for administering to such patients, as a small drop placed on the back of the tongue is sufficient to produce a rapid purgative action. When applied to the skin it acts as an irritant and produces a crop of pustules. In doses larger than one minim it acts as an irritant poison and produces gastro-intestinal inflammation with severe vomiting, persistent purging, painful straining, colic, cramps in the limbs, collapse and death within a few hours. In Indian medicine it is used as a purgative in dropsy, and accidents have happened from its use by quacks.

The poison is rapidly eliminated by vomiting and purging, and it is not necessary to empty the stomach unless the case comes under observation very early. The patient should be kept in a warm bed and given stimulants and demulcent drinks. Abdominal pain and painful straining may require laudanum by the mouth or morphine by hypodermic injection.

Curare or the African arrow poison. It is an extract from a leguminous plant used by the West African natives as an arrow poison. It is very potent when injected under the skin, but is said to be harmless when taken by the mouth. It produces irritation of the skin at the site of injection, rise of temperature, difficult breathing, feeble pulse and death from asphyxia on account of the paralysis of the respiratory muscles. Medicinally it is used in minute doses in tetanus, hydrophobia, and strychnine poisoning to reduce the severity of convulsions. In case of poisoning through a wound on the extremities a ligature should be tied above the site to prevent its absorption, and the wound opened up, washed thoroughly and cauterized. Wounds on the body should be opened and cauterized as soon as possible. Internally, stimulants and plenty of water should be given to help the elimination of the poison by the kidneys. Artificial respiration will have to be carried out in case there is respiratory failure.

Dhatura or the Thorn Apple. It is a small shrub about three feet high which grows wild in India and the Asiatic countries. Its flowers are either white or purple and showy, but have a fetid disagreeable smell. The fruit is round, about the size of a walnut, and is covered with sharp rigid spines. The seeds are small, flat, brown or black and resemble capsicum seeds for which they are likely to be mistaken. They are odourless, but have a bitter unpleasant taste when crushed in the mouth. All parts of the plant are poisonous. Accidental poisoning in children occurs from sucking the flowers.

Preparations of the seeds and leaves are used in medicine and dried leaves are smoked to relieve paroxysms of asthma. In Indian medicine it is used for the relief of neuralgia, dysmenorrhoea, and as a sedative in maniacal insanity. Like Indian hemp it is much used in India for criminal purposes and powdered seeds or leaves are administered in highly flavoured food or sweets to stupefy the victim before committing robbery or rape. The symptoms and treatment for dhatura poisoning are the same as for belladonna poisoning.

Digitalis or Foxglove. It is a small shrub which is indigenous to the British Isles and many parts of Europe and Asia. The leaves are downy on the under surface, the flowers are purple and flask-shaped with slight odour. All parts of the plant are poisonous and accidental poisoning has occurred in children from sucking the flowers. The leaves are used for medicinal purposes and the active principle is extracted from them. Its preparations are used in small doses as a cardiac tonic. The effect of a poisonous dose is mainly on the heart and blood vessels. Small doses frequently administered for a prolonged period accumulate in the body and produce symptoms of poisoning. It is also a gastro-intestinal irritant, and a large dose produces nausea, vomiting, abdominal pain, purging, palpitation, a sense of oppression in the chest, slow pulse, dimness of vision and diminution or suppression of urine. Death takes place from heart failure. The patient is to be kept at rest in bed, and after emptying the stomach hot tea, coffee or other stimulants are to be given.

Fool's Parsley or Lesser Hemlock. It is a small herb which resembles ordinary parsley and has been gathered in mistake for it with serious results. Its leaves are darker green in colour and when crushed have a peculiar disagreeable odour quite unlike parsley. The root is bulbous and resembles a small turnip and has been eaten in mistake. Nausea, persistent vomiting, pain in the abdomen, diarrhoea, difficulty of breathing and swallowing, and collapse are the symptoms produced by a poisonous dose.

Fungi or Mushrooms. They are found in almost all the countries of the world growing in cold, damp and shady places on decaying organic matter. Some species of fungi are edible, while others are poisonous and produce dangerous symptoms. The harmless edible variety grows singly in open, airy places, has a compact substance, white colour which does not change on keeping, pleasant taste, and not a disagreeable odour. The poisonous variety grows in clusters, have different colours which change on keeping, their flesh is soft and exudes a watery or milky fluid when cut, the taste is acrid and bitter, and the smell unpleasant. Some persons get very unpleasant symptoms from eating the non-poisonous variety.

Different varieties of poisonous mushrooms produce different symptoms. One variety that is found in Siberia is used by the natives as an intoxicant. In moderate doses it produces a state of excitement with dancing, shouting and jumping. In larger doses it acts as a narcotic poison, paralyses respiration and causes death. Poisonous mushrooms are gastro-intestinal irritants and produce nausea, vomiting, violent pain in the abdomen, diarrhoea, giddiness, profuse sweating, suppression of urine, convulsions, coma and death within twelve hours from the commencement of the symptoms or twenty-four hours after eating them. There is no specific antidote for mushroom poisoning. The stomach is to be emptied as soon as possible and the patient given copious draughts of water or other liquids to stimulate the kidneys to eliminate the poison. Stimulants are necessary in case of collapse and morphine or laudanum for the relief of pain.

Hemlock or Cowbane. It is a small shrub that grows wild in many parts of Europe and Asia. Its Indian name is *koordamana* or *khorasani ajwan*. It resembles parsley in appearance and is liable to be mistaken for it. Its fruit is dark greenish-grey and is like anisum, but is smaller, elongated, has five ridges on the surface, and on sectioning it is found to be resinous, dark yellow in colour, with an offensive smell and unpleasant taste. All parts of the plants are poisonous. The active principle extracted from the leaves and fruit is called coniine which is used as an antispasmodic in asthma, chorea, and epilepsy. A decoction of the plant was used for the execution of Socrates in ancient Greece.

The poisonous symptoms are a sense of constriction in the throat, vomiting, purging and muscular paralysis which commences in the lower limbs and spreads upwards until the muscles of respiration are involved when death takes place from asphyxia within an hour or so. The treatment to be of any effect should be commenced and the stomach emptied immediately.

Hyoscyamus. Deadly Nightshade or Henbane. It is a biennial plant with leaves of a greenish grey colour, hairy on the surface and with an unpleasant odour and bitter acrid taste. The plant grows in Europe, America, and many Asiatic countries. It has numerous flowering tops, the flowers being arranged on erect spikes; the fruit is globular containing many black kidney-shaped seeds which have an acrid unpleasant taste. All parts of the plant are poisonous. The alkaloids extracted from the plant are called hyoscine and hyosciamine which are used in medicine in munite doses as a sedative. The former is used with morphine to induce "twilight sleep" for painless confinement. The symptoms of poisoning by it and the treatment are the same as for belladonna.

Lobelia Inflata or Indian Tobacco. It is also known as gag-root or vomit wort and grows wild in North America from where it is imported into Europe. Its leaves are like those of tobacco; the flowers are pale blue, and the fruit is small, globular, and of the size of a pea, containing small oblong seeds. It has an unpleasant odour and slightly acrid irritating taste resembling that of tobacco. It exudes a resinous fluid when cut from which the active principle known as lobeline is extracted. The tincture made from the dried flowering herb is used as an antispasmodic in asthma. The symptoms produced by a poisonous dose are vomiting, pain in the stomach, twitching and severe pain of the facial muscles, painful spasms, collapse, unconsciousness and death which may take place within half an hour or after forty-eight hours. Very early evacuation of the contents of the stomach and the administration of stimulants are necessary for treatment.

Jatropha Curcas or Physic Nut. It grows on a large evergreen shrub called *juva tree* which is found in India, Ceylon, and other Asiatic countries, its Indian name being *moglai arandi*. The plant exudes a thick, milky, bitter juice from the stem. Its fruit is about the size of a walnut, and resembles hognut, containing three seeds very much like castor oil seeds. The oil expressed from them is known as pulza oil which is pale yellow in colour and free from any disagreeable smell or taste and is used in Indian medicine as a vermifuge and purgative. The milky juice from the stem is used externally as a counter-irritant in chronic inflammatory conditions of the joints, and the oil is applied to the skin for eczema and ringworm. The fresh juice is applied to a cut surface to stop bleeding and expedite the process of healing. The symptoms produced by a poisonous dose are burning of the throat, vomiting, violent purging, pain in the abdomen, intense depression, and collapse. The treatment is the same as for croton seed poisoning.

Laburnum. It is found in many countries and is grown for its showy flowers. The alkaloid contained in the seeds, flowers, and bark is known as cyticine, which is an insecticide and is used in many insect powders. Accidental poisoning in children is caused by eating the flowers. The symptoms are dryness of the mouth, vomiting, purging, pain in the abdomen, difficult breathing, convulsions, and delirium. Death may take place within a couple of hours or after three or four days. Artificial respiration may be required in case of respiratory failure, and stimulants to combat depression.

Marking Nut. It grows on a tree found in the forests of India, Burmah, and Ceylon, its vernacular name being *bhilava* or *bibba*. Its flowers are small and greenish in colour and the fruit, which is known as marking nut, is round, flattened and an inch in diameter with a hard, black, shining rind containing a thick brownish black acrid juice which turns black on exposure to the air. It is used by washermen in India for marking linen, hence the name. It is a vesicant if applied to the skin and produces deep blue marks and ulceration which resemble bruises caused by injury. It is sometimes used in this way in India for the purpose of bringing a false charge of assault against an enemy. The ulceration produced by it takes a long time to heal and leaves an ugly scar. In Indian medicine the juice is used externally for chronic inflammation of joints, and internally in minute doses in milk or butter as a stimulant, digestive and nervine tonic, also in asthma, scrofula, leprosy, and venereal disease. The nut or the juice when swallowed causes violent symptoms of gastro-intestinal irritation, severe abdominal pain, vomiting, diarrhoea, cramps, convulsions, collapse and unconsciousness. Death may take place within a few hours. The treatment consists in eliminating the poison and giving stimulants.

Morphine. See Opium.

Nicotine. See Tobacco.

Nutmeg. It grows on a tree which is cultivated in Ceylon, Malaya, the East Indies, and the Phillipine Islands. Its Indian name is *jaiphal*. It is the seed found inside the fruit which is of the size of a walnut, oblong in shape and of a yellowish colour, with a hard shell which splits into two when the fruit is ripe, exposing the seed covered with mace. The seed is hard, has an agreeable aromatic taste and is used for flavouring food. The volatile oil distilled from it and powdered nuts are used in medicine as carminative, stimulant and astringent in diarrhoea. In small doses it stimulates appetite, improves digestion and relieves flatulence, but in large doses it is an irritant and narcotic poison. Fatal cases of poisoning in children have occurred from eating the nut. The symptoms produced by a poisonous dose are giddiness, unsteady gait, vomiting, headache, dryness of the mouth, delirium and coma. There is no specific treatment for it and the same measures as for other vegetable poisons are to be adopted.

Nux Vomica. There are four or five varieties of the nux vomica tree which grows wild in many tropical countries—in India, Ceylon, the East Indies, the Phillipine Islands, Brazil and Guiana. The common variety known as strychnos nux vomica grows wild in India, its vernacular name being *kochla*, *jher kochla* or *katchura*. The fruit is smooth, yellowish in colour when ripe, of the same size as a small orange, pulpy inside, containing a bitter sticky fluid and from one to five seeds which are disc-shaped, three-fourth to one inch in diameter, flattened, and irregularly bent, grey or ash coloured, with a smooth silky surface and a depression in the centre. They are hard, horny in texture, without any odour, but with a persistent bitter taste. The alkaloids obtained from the seeds are strychnine and brucine, the former being more powerful and much used in medicine in very small doses—1/64 to 1/16th of a grain. Nux vomica is a powerful tonic which is very beneficial to convalescent patients recovering from a severe illness.

Strychnine has a cumulative effect and small doses taken for a long period collect in the body and produce poisonous symptoms; cases of poisoning are likely to occur from its prolonged use even in medicinal doses. If a long course is necessary it should not be continued for longer than ten to fifteen days without an intermission of a week or so. The symptoms of acute poisoning come on within five to fifteen minutes and death takes place within an hour of taking a poisonous dose. The symptoms are a sense of constriction and oppression in the throat, suffocation, restlessness, twitching of muscles, stiffness of the head, neck, back and abdomen, and violent convulsive movements of the whole body, which are brought on or are aggravated by any slight stimulus, such as a loud noise, sudden touch, draught of wind or bright light. The patient is unable to breathe during a seizure and feels suffocated. He remains conscious and retains his intellect till the last. If he survives for two hours or so he has good chances of recovery.

The stomach should be emptied as early as possible and washed thoroughly to remove the poison that has remained unabsorbed in it; for this purpose the stomach tube or any emetic that is at hand should be used. Convulsions, when fully developed, will require whiffs of chloroform to keep them in check, or oral administration of 20 grains of chloral hydrate dissolved in water, which may be repeated after an hour if necessary. Hot tea, coffee, or other liquid food is to be given freely so as to allay thirst and expedite the elimination of the poison through the kidneys. If a large dose of strychnine is swallowed the symptoms develop so rapidly and death is so quick that there is no time to do anything.

Oleander. It is a shrub about eight feet high that grows in India and other Asiatic countries. It has narrow elongated leaves about five inches long and white or red flowers. Its bark and roots are used in Indian medicine as a diuretic and cardiac stimulant and externally for many skin diseases. The powdered root is used in the form of paste for procuring criminal abortion and many fatal cases have occurred from its use. Powdered dry leaves are used to promote nasal secretion. It acts on the heart and a poisonous dose first slows it and then stops it. The treatment is the same as for digitalis poisoning.

Opium. Opium is the dried juice collected from the incised unripe capsules of the white poppy plant which is cultivated in India, China, Afghanistan, Iran, and Turkey. It is about two feet high and bears white or red flowers. The vernacular name for it is *afin* or *afiun.* In India it used to be sold in licensed shops under government control. When fresh it is homogeneous, soft, and dark brown in colour, but becomes hard and almost black when exposed to air. It has a characteristic odour and slightly bitter acrid taste. It is a narcotic poison and its poisonous property is due to the presence of several alkaloids in it, the most important of these being morphine, codeine, narcotine, and thebaine. There are many medicinal preparations for internal and external use containing opium, and it is the most powerful drug nature has placed at our disposal for the relief of pain and for inducing sleep. Morphine is used hypodermically and has many advantages over opium. Codeine has a soothing effect on the respiratory organs and is used for the relief of irritating cough. Taken by the mouth opium is a powerful astringent also, and is much used in combination with other drugs in diarrhoea and painful dysentery. In many eastern countries it is a common drug of addiction, while in Europe and America morphine, and heroin which is also prepared from opium, are used by addicts. In India opium is used for committing suicide as it produces quiet and painless death.

A small dose of opium produces an initial stage of stimulation of the brain, brightness of imagination, and a sense of comfort and well-being ; but this first stage soon passes away, or is absent if the dose is large and in some susceptible persons. This is soon followed by intense depression and narcosis. In addicts the stage of stimulation is longer, but to keep up this effect the dose has to be constantly increased, while the after effects are much worse. Children are very susceptible to opium and for therapeutic purposes much smaller doses are given. Working class women dope their children with minute doses of opium to keep them asleep during the day ; some ayahs and nurses also often resort to it to keep their charges quiet so as to have an easy time, and many fatal cases have occurred in such cases.

Opium acts on the brain and produces restlessness, giddiness, flushed face, contracted pupils, rapid pulse, drowsiness, and finally stupor from which the patient cannot be roused. The breathing is laboured and noisy, the skin covered with perspiration, the lips and the face become livid and the coma deepens till the respiration stops. On account of the strong sedative effects of opium on the nerves emetics do not act, it is therefore necessary to employ the stomach tube. Copious and frequent draughts of warm water or a dilute solution of permanganate of potassium are introduced into the stomach for washing it out thoroughly and a small quantity of the latter is left in the stomach after its contents are evacuated. The patient is prevented, as much as possible, from falling asleep by flicking his face and body with wet towels, holding smelling salts to the nostrils, and frequently calling him loudly. He is unable to stand or walk and no attempt should be made to drag him about and completely exhaust him. Atropine is the physiological antidote for opium or morphine poisoning and is given in 1/50th of a grain hypodermically and repeated after a couple of hours ; in its absence tincture of belladonna, 15 to 20 minims in an ounce of water, may be given by the mouth. Other stimulants by the mouth or hypodermically are also given at intervals and artificial respiration tried if the breathing fails. Some cases relapse after getting over the severe symptoms and die.

For chronic poisoning in addicts it is not advisable to stop the drug at once as it is likely to cause great depression and mental disturbance or maniacal excitement. Outdoor exercise and other measures for the promotion of health are necessary to wean the addict from his habit.

Red Leadwort or Plumbago Plant. It is an evergreen garden shrub about five feet high that grows in India. The roots yield an acrid yellow juice when bruised which is used externally in Indian medicine. The root is given internally in small doses as a gastric stimulant in chronic dyspepsia and diarrhoea. The paste is applied to the mouth of the womb for procuring criminal abortion, but it is uncertain in its action and has caused fatal poisoning. In large doses it acts as an irritant and a narcotic poison. There is no antidote for it and the same measures as for other poisons, viz., emptying the stomach and the administration of stimulants, are to be adopted.

Tobacco. It is used all over the world for smoking and chewing purposes and in the form of snuff which is specially treated and finely powdered leaves. The plant is about two feet high with large broad leaves which contain a colourless, odourless, oily liquid alkaloid called nicotine which on exposure becomes brown and acquires the characteristic odour of tobacco. It is a deadly poison and destroys life very rapidly, one grain of it being enough to kill a grown up person within a few minutes. Cigars and cigarettes contain from one to five per cent of nicotine, and the total quantity present in a cigar, if absorbed into the system, is enough to cause very serious symptoms. While smoking, most of it escapes with the smoke or is collected at the end of the cigar or cigarette ; the last inch and a quarter of it should, therefore, be discarded. In pipe smoking most of it is precipitated in the stem which should be washed periodically. It could be prevented from being inhaled by the use of a filter, cotton wool impregnated with powdered charcoal being an efficient filter for nicotine. Inhaling the smoke and retaining it in the lungs is very harmful as it allows a good deal of nicotine to be absorbed. It can be absorbed through the unbroken skin also and cases of poisoning have occurred after using a strong infusion on the skin or wound.

All smokers are familiar with the unpleasant symptoms of mild nicotine poisoning experienced during their earlier efforts at smoking. These are nausea, vomiting, giddiness, faintness, pallor of the skin, and muscular weakness. A larger dose produces more severe symptoms with dimness or loss of vision, dilated pupils, and difficulty of breathing. Although habit establishes a certain amount of toleration, the effects of chronic nicotine poisoning are found in all excessive smokers and users of tobacco. These are habitually fast and irregular pulse, palpitation on slight exertion, dry persistent cough, muscular weakness and tremors, pain in the heart area, inability to undergo much physical or mental work, insomnia, and dimness or loss of vision.

The treatment of acute poisoning is to eliminate the poison as soon as possible, to keep the patient at complete rest and administering stimulants. Artificial respiration is necessary in case respiration fails. In chronic poisoning the use of tobacco should be stopped completely and the patient encouraged to take open air exercise and adopt other measures for the improvement of health. Tobacco craving is very easily overcome, and if none is kept in the house it does not last long. The heart symptoms and blindness soon disappear provided no permanent damage is done to the organs.

Turpentine. It is the exudate or resin obtained from many species of pine ; and the oil of turpentine is distilled from it. It is much used in industry being a good solvent of oils, resins, wax, sulphur, and phosphorus. In very small doses it is used internally in bleeding from the stomach and for intestinal worms, and externally as a counter-irritant. It is also used as an inhalent in acute and chronic inflammation of the respiratory passages for its soothing effect, but when inhaled as a strong vapour it causes irritation and inflammation. It is administered in phosphorus poisoning as an antidote as it dissolves it and renders it harmless. A large dose causes nausea, giddiness, unsteady gait, langour and sleepiness. Death may take place within a few hours or may be delayed for some days and is due to suppression of urine as turpentine causes an acute inflammation of the kidneys. After emptying the stomach the patient is kept in bed on liquid diet until the kidneys act normally.

Non-metallic Other Poisons.

Alcohols. The word is used in the plural because in addition to the ordinary alcohol, which is called ethyl alcohol, there are other alcoholic bodies with similar chemical composition known under different names, such as methyl alcohol or wood naphtha, amyl alchol or fusel oil, butyl alcohol, etc., which are used in industry and arts. *Methyl alcohol* is distilled from wood and is used as a solvent for paints, varnishes and resins ; it is also mixed with rectified spirit to render it unfit as a beverage, the mixture being known as methylated spirit. Chronic poisoning from methyl alcohol is common among poorer classes who use it as an intoxicant in place of more expensive ordinary alcoholic beverages. Pure methyl alcohol does not produce the same stimulating or intoxicating effect as ethyl alcohol and the stage of depression comes early and lasts much longer. It produces nausea, vomiting, headache, dimness of vision, collapse and unconsciousness and death from respiratory failure. In chronic poisoning there are dimness of vision and hearing, disordered digestion, heavy aching head, pain in the limbs, and confused mental faculties.

Ethyl Alcohol or Spirits of Wine is present in varying proportions in all alcoholic beverages. The percentage in various drinks is, beer and other fermented ales, 4 to 6 ; light wines, 6 to 8 ; heavy wines 8 to 10; sherry, port, etc., 14 to 20 ; liquors, 30 to 50 ; brandy, whisky, gin, rum, etc., 40 to 50 ; and rectified spirit, 80.

Acute alcoholic poisoning is caused by indulgence in a large quantity of any of these. The severity of the symptoms vary in different persons and according to the quantity of alcohol taken. Habitual use establishes a certain amount of tolerance and certain races tolerate it better than others. There are few persons who have not experienced the exhilarating effects of a moderate dose of alcohol on the mind and body. A moderate amount produces an initial stage of excitement and stimulation during which the subject becomes jovial, noisy, talkative, has a sense of well-being, increased courage and self-confidence. He loses all inhibitions and even the sense of responsibility, and becomes very communicative and many a secret has been given away by responsible persons under the influence of alcohol.

The duration of this initial stage varies in different individuals and is short in children and persons unaccustomed to the use of alcohol, or when it is taken on an empty stomach. In the next stage there is incoordination of the finer muscular movements, unsteady gait, difficulty of articulation, double vision, and inhibition or loss of moral control, which may lead to quarrelling, assault, destruction of property, rape, and even manslaughter. This is followed by depression, drowsiness, sleeplessness and coma if a large dose is taken, from which the patient cannot be roused. Alcoholic coma is liable to be mistaken for that produced by apoplexy, diabetes, uraemia, etc., or these conditions may be mistaken for alcoholic coma, especially if the patient has taken alcohol by way of treatment before becoming unconscious. (See Unconsciousness).

There is very little to be done by way of treatment, unless the patient is deeply comatose from a very large dose. The best thing to do in such a case is to put him to bed and let him sleep it off. He shoud be protected against chills as, in such a condition he is very liable to get pneumonia or other respiratory diseases. In bad cases it is necessary to empty the stomach so as to remove the unabsorbed alcohol, and introduce hot tea, coffee or milk.

Chronic alcoholic poisoning, found in addicts, produces gastric irritation, nausea, loss of appetite, emaciation, and chronic inflammation of the liver called cirrhosis of the liver in which the liver tissue is destroyed. Chronic inflammation of the kidneys seriously damages their function, chronic multiple neuritis causes wasting and paralysis of muscles, and the hardening of the arteries might cause their rupture in the brain and produce paralysis of one side of the body. Chronic alcoholic subjects are very liable to suffer from delirium tremens (q.v.). The treatment of chronic alcoholism consists in gradually reducing the quantity of alcohol consumed, giving it in a diluted form and at meal times only, building up the body with tonics, nourishing diet, and open air exercise. Very little can be done if any of the organs is damaged. The cause of chronic excessive indulgence in alcohol, in almost all cases, is psychological and unless this is discovered and removed the patient cannot be weaned from it.

Amyl Alcohol or Fusel Oil. It is an oily liquid with a sharp burning taste and a fruity odour. It is present in small quantities in ethyl alcohol distilled from fermented liquors, its proportion being largest in spirit distilled from potatoes. It is used in chemical industry for the manufacture of artificial fruit essences, aniline dyes, etc. As an intoxicant and poison it is more powerful than ethyl alcohol, but not being easily available cases of poisoning from it are rare.

Aniline or Aniline Oil. It is a colourless oily liquid with a mild, pleasant smell and burning aromatic taste. It is manufactured from coal tar and is used for making aniline dyes and as a solvent for fats. It can be absorbed from the unbroken skin and may cause chronic poisoning. Taken internally it acts as a narcotic poison and causes intense lividity of the face, fingers and toes, giddiness, muscular weakness, nausea, headache, difficult breathing, and stupor.

Antipyretic and Anodyne Drugs. A large number of these drugs has become very popular which are being freely used by the public. Most of these are dangerous and unsuitable for self-administration, and many cases of acute and chronic poisoning have occurred from their indiscriminate use. They are frequently used for the relief of headache, neuralgic pains, fever, rheumatism, and painful menstruation. Their prolonged or frequent use, even in medicinal doses, has been followed by serious and fatal results. Most of these have a depressing effect on the heart muscle and may cause death from heart failure. Some of these are official in the British Pharmacopoeia, while others are sold under short trade names. Some of the more common ones are given below with the usual dose. It is advisable not to exceed the minimum dose when prescribing, and avoid their habitual use. These are antifebrin 2 to 5 grains ; antipyrin 5 to 15 grains ; phenacetin 5 to 15 grains ; aspirin 5 to 15 grains ; exalgin ½ to 2 grains ; pyramidon 5 to 10 grains ; atophan 5 to 10 grains.

The symptoms produced by an overdose are palpitation, difficulty of breathing, lividity of the skin, drowsiness, collapse and unconsciousness. Frequent use of atophan causes a fatal condition of the liver called acute yellow atrophy (Vol. II). The treatment for all these is early evacuation of the contents of the stomach, administration of stimulants, and artificial respiration.

Camphor. It is a concrete volatile oil obtained by distilling the roots, leaves and branches of the camphor plant, that grows in China, Formosa and Japan. It has a characteristic penetrating odour and a pungent slightly bitter taste followed by a sensation of cold. It burns readily with a smoky flame and when rubbed with thymol or methol it forms a liquid. In small doses, 2 to 5 grains, it is used internally as a carminative and stimulant, and as an inhalent with other drugs in chronic respiratory complaints. Externally it is used in liniments, and dissolved in oil it is used hypodermically as a cardiac and respiratory stimulant. Criminally it is used by quacks for procuring abortion, but it is ineffective except in poisonous doses. A dose of 20 grains or so acts as an irritant poison and produces symptoms similar to those produced by alcohol, but the initial stage of excitement is very short and is soon followed by depression, giddiness, tingling, numbness and tremors in the limbs, difficulty of breathing, disturbance of vision, convulsions, and loss of consciousness. The treatment is the same as for alcoholic poisoning.

Cantharidin. This is a crystalline odourless substance obtained from the blister fly. It is used externally in medicine in the form of tincture, plaster or blistering fluid as a vesicant and counter-irritant, and internally in minute doses as a stimulant to the kidneys. Dry powdered flies are used by quacks in aphrodisiac medicnes and many cases of poisoning have occurred from their indiscriminate use. In addition to all the symptoms of an irritant poison there is scanty bloody urine or complete suppression of it on account of its powerful irritant effect on the kidneys. Death may take place within a few hours, or after some days from acute inflammation of the kidneys. The treatment of poisoning by cantharidin is the same as for other irritant poisons. As it is soluble in oils no oils should be given to the patient nor any preparation containing it.

Carbon Disulphide. It is a clear, colourless, highly volatile and inflammable liquid with a disagreeable odour. It is a good solvent of oils, sulphur, iodine, phosphorus, and rubber, and is much used in industry. In agriculture it is used for destroying vermin and insects. As it gives off heavy vapours at room temperature it is not safe in close ill-ventilated rooms. Chronic cases of poisoning occur among persons who have to handle it, and is due to constant inhalation of the vapour. In acute poisoning the symptoms are nausea, vomiting, giddiness, cramps, difficulty of breathing, convulsions, and unconsciousness. If the poisoning is due to inhaling strong vapours the patient should be immediately removed to open air and given artificial respiration, and oxygen, if available, should be administered.

Creosote. It is a pale yellow, thin oily liquid with a strong characteristic odour, which is obtained by the distillation of wood tar. It is a powerful antiseptic and acts as an irritant poison if taken internally, producing burning, blisters and corrosion of the mucous membrane of the mouth, nausea, vomiting, diarrhoea, convulsions, and unconsciousness. Externally it is used in some skin diseases, and internally in minute doses of 1 to 3 minims as an intestinal disinfectant, and in phthisis and other chronic diseases of the respiratory organs. On account of its strong smell and acrid taste cases of accidental poisoning are rare. The same treatment as for other irritant poisons is to be given.

Disinfecting Fluids. Phenol or carbolic acid, phenyl, lysol, cresol, and many other disinfecting fluids are extensively used and cases of accidental and suicidal poisoning have occurred from swallowing them. They are all corrosive poisons when pure, and irritants when diluted. Two to five per cent solutions of these in water are used as antiseptics and disinfectants. Phenol is a crystalline substance which is diluted with 10 per cent of water and sold as carbolic acid. When swallowed these fluids produce corrosion of the mouth, lips, tongue and throat. The corrosive action continues in the stomach and causes vomiting, pain in the stomach, etc. The general symptoms are giddiness, difficult and noisy breathing, lividity of the face, low temperature, collapse and coma. In some cases the severe symptoms subside for a short time under treatment, after which relapse sets in and the patient becomes unconscious and dies.

Some of these fluids get absorbed through a wound or unbroken skin, and if too freely used cause poisoning symptoms. The treatment is to eliminate the poison from the stomach as early as possible and give mild stimulants. The chemical antidote for carbolic acid is sulphate of magnesium or lime water which is given in sufficient quantity to neutralize the acid.

Formalin. It is a 40 per cent watery solution of a strong irritant gas called formaldehyde, used for disinfecting rooms and delicate fabrics likely to be damaged by heat or steam. It is used in industry for the manufacture of artificial ivory, celluloid, bakelite and similar other substances. It is also used as a preservative for pathological specimens, and was at one time much in use as a food preservative, but its use as such has been prohibited by law in many countries on account of its poisonous property. The solution gives off the gas at room temperature which is harmful in close ill-ventilated rooms. When inhaled it irritates the mucous membrane of the nose and respiratory passages, and when swallowed it acts as an irritant poison.

Hydrocyanic Acid or Prussic Acid and Cyanides. Hydrocyanic acid is a colourless liquid with a peculiar peach blossom odour and a bitter taste. In the undiluted form it is a very rapidly acting poison causing immediate unconsciousness and death even when it is inhaled. Fortunately the pure acid is not available outside the laboratory. It is present in bitter almonds, cherry-laurel leaves, and wild cherries in small quantities ; the peculiar flavour and the bitter taste of these is due to its presence. Ships and storehouses are fumigated with its vapours to destroy insects and vermin. Cyanide of potassium is employed in photography, electroplating, and dyeing. Ferrocyanide of potassium is used in metallurgy, tanning, and other industries.

On swallowing or inhaling the strong acid the victim suddenly collapses with a cry and dies on the spot. A milder dose causes giddiness, staggering, gasping respiration, foaming at the mouth, cold skin. convulsions, and unconsciousness. Death may take place within a couple of minutes from respiratory failure. There is hardly any time to give any treatment in such cases ; in milder cases the stomach is emptied as soon as possible and washed with a dilute solution of permanganate of potassium and a little peroxide of hydrogen left in it. Cardiac stimulants, such as cardiazol, coramin, citrate of caffeine, are to be administered and artificial respiration given if breathing stops.

Hypnotics and Sedative Drugs. There is a large number of these drugs that are used for the relief of pain and sleeplessness, but their indiscriminate use without medical advice is very dangerous. Many women are in the habit of taking them regularly for the relief of painful menstruation, as the remedy is simple, readily available and quick in its action. Many fatal cases of chronic diseases of the blood among better class women have been traced to the evil effects of these drugs. Most of these are sold under short trade names. They are habit-forming if taken frequently and their sedative effect is weakened after a time so that the dose has to be increased constantly to produce the desired sedative effect until the lethal dose is reached and many deaths have occurred in this way. Their habitual use, even in medicinal doses, produces dullness of mental faculties, partial or complete loss of memory, inability to concentrate the mind, muscular tremors, stammering, and even insanity. They should be taken under medical advice and should not be continued for long. The names of some of these hypnotics are given here : Adalin (Uradol), Barbitone, Chloral Hydrate, Chloretone, Hedonal, Medinal, Luminal, Paraldehyde, Prominal, Pyramidon, Sulphonal, Trional and Veronal.

The symptoms produced by an overdose are drowsiness followed by unconsciousness, complete relaxation of muscles, lividity of the skin, difficulty of breathing and deep coma which ends in death. The cases that recover suffer for a long time from the effects of damage to the brain and kidneys.

Iodine. It is a non-metallic element met with in the form of small prismatic crystals of a dark brown colour. It is very slightly soluble in water but dissolves freely in alcohol. The tincture is used for disinfecting the skin and superficial wounds. Applied to a raw surface it is very irritating, but the irritation does not last long. In minute doses it is given internally. Accidental poisoning occurs sometimes from swallowing the tincture which is an irritant poison. The colour of the vomitted matter varies according to the nature of the contents of the stomach, being dark blue if starch is present. There may be greyish white patches on the tongue and the mucous membrane of the mouth.

Mineral Oils. Under this term crude oil, kerosene of different grades, and petrol are included. They are used for lighting purposes and in internal combustion engines and also in industry as solvents for many chemicals and for dry cleaning of clothes. When taken internally they produce local symptoms of irritant poisoning and general symptoms also, such as headache, giddiness, unsteady gait, tremors, cramps, and unconsciousness. Suicidal and accidental cases of poisoning from kerosene oil occur occasionally. Mild intoxicating effects are produced by inhaling petrol vapour, but constant inhalation, as by those working in oil wells, refineries and industries where kerosene or petrol is used, is likely to produce symptoms of chronic poisoning, which are depression, headache, insomnia, derangement of digestion, muscular weakness and tremors, and skin eruptions. The treatment is the same as for irritant poisons.

Naphthalene. This familiar substance is produced from coal tar and is used for disinfecting urinals, water closets, etc., and for protecting warm clothing from the ravages of the moth. Accidental poisoning in children has occurred from swallowing the balls of naphthalene. It is an irritant poison and its constant application to the skin causes irritation and pustular eruptions. Taken internally it produces nausea, vomiting, headache, depression, profuse perspiration, staggering gait, painful micturition, lividity of the face, and drowsiness. The same treatment as for irritant poisons is to be adopted.

Phosphorus. There are two varieties of phosphorus, yellow and red. The latter is non-poisonous and is used for manufacturing safety matches, while the former is a yellow wax-like substance which is luminous in the dark and ignites by itself when exposed to the air ; for this reason it is always kept under water. It is a corrosive poison if swallowed, and causes severe burns if applied to the skin. It is the chief ingredient of many rat poisons and vermin killers. In medicine it is given in minute doses as a nerve tonic. In addition to the usual symptoms of corrosive poisoning there is a strong smell of rotten garlic in the breath of the patient. The vomited matter is luminous in the dark and has the same odour. Death takes place within a short time if the quantity swallowed is large. Phosphorus is soluble in oil ; it should not therefore, be given in case of poisoning, nor any substance containing it. Milk should be given only when the stomach is emptied and washed out. Sulphate of copper is the chemical antidote for phosphorus and is given in five to ten grain doses diluted with water.

Trinitrotoluene or T. N. T. It is a yellow explosive substance which was manufactured on an extensive scale during the two world wars. Fatal cases of poisoning have occurred among the workers from absorption through the unborken skin. The early symptoms are loss of appetite, yellow staining of the skin, localized rash on the exposed parts of the body, and digestive trouble. In severe cases, in addition to the above, intense itching of the skin, eczema, jaundice, anaemia, and pale muddy colour of the skin are present. The kidneys are damaged and the urine contains albumen. The symptoms get progressively worse and the patient becomes comatose and dies. Recovery from T. N. T. poisoning is slow and some cases relapse and die after apparent recovery.

As the poison gets absorbed through the skin the prevention consists in protecting all exposed parts of the body and undergoing periodic examination so as to detect early signs of poisoning.

Mechanical Irritants. Finely powdered glass, mixed with food, is sometimes used for homicidal purposes. It has no poisonous property apart from its mechanical effect on the stomach. It is not easy to administer.

Food Poisoning. It is due to several causes. (1) The food may be poisonous, such as certain fishes and fungi. (2) It may be wholesome but on account of allergy (q.v.) unpleasant symptoms are produced. (3) Certain preservatives or colouring agents used in it may be poisonous. (4) Putrefaction and the growth of harmful bacteria in the food. (5) Contamination with poisonous metals, such as copper, lead, antimony, etc., during the process of cooking or storage. Many of these conditions have already been described. The term ptomaine poisoning is applied to poisoning caused by eating decomposed food, but such food in itself is not poisonous, as game, fish and meat are often eaten when decomposed without any ill effects, but stale food is liable to be infected with virulent bacteria. The term botulism is now applied to acute poisoning from eating food which is infected with such bacteria and which contains their toxin. The symptoms appear some hours after the food is eaten or may be delayed for 12 to 24 hours. The patient feels a sensation of distension of the stomach, nausea, vomiting, sometimes diarrhoea, headache, dizziness, dryness of the mouth, disturbance of vision, and great prostration. Death may take place from exhaustion within a few hours.

As the symptoms appear when all the toxin is absorbed into the system emptying the stomach is not of any use. The patient's strength is to be maintained by light nourishing diet, mild stimulants and rest in bed. Vomiting should not be checked as a certain amount of poison is excreted in it. Copious draughts of weak tea, water or other liquids are given to replace the loss of fluid and to increase the flow of urine. A mild saline may be necessary if the bowels are confined. An antitoxin prepared from the bacilli is used in the treatment of this condition, but to be of any use it has to be injected early and before the muscles of respiration are paralysed. The treatment of food poisoning from other causes has been described elsewhere.

Poisonous Gases. Cases of accidental and suicidal poisoning from gases are fairly common, and homicidal cases are sometimes met with. There are many poisonous gases which are used in industry and for lighting and cooking purposes. During the first World War many poison gases were developed and used in warfare. Some of the gases more commonly met with have been described below. In every case of poisoning from a gas the first thing to do is to remove the patient immediately to open air, commence artificial respiration and administer oxygen inhalation, if it is available, and arrange for transfusion of blood. The rescuer should take all precautions and avoid inhaling the poisonous atmosphere.

Carbon Monoxide Gas. It is a lighter than air, colourless, odourless, and highly poisonous gas, that is present with other gases in coal gas used for illuminating and heating purposes. It is found in exhaust gases of motor cars and other internal combustion engines and is given off with carbon dioxide gas from charcoal fires, especially when the supply of air or oxygen is limited. Burning charcoal in a brazier in a closed or ill-ventilated room is extremely dangerous as the gas collects in the room and being odourless its presence is not detected until it is too late. In India, heating water on a charcoal fire in a closed bath-room has caused many fatal accidents. A charcoal brazier should not be brought into a room until all the coal is properly lighted and all blue flames, which are due to the presence of this gas, have disappeared. It is also generated in brick and lime kilns and closed sewers. Leaky gas pipes have been responsible for many fatal accidents, as also defective burners or carelessness in the use of gas stoves. In case of a leaky pipe the room should be thoroughly ventilated and all gas allowed to escape.

Carbon monoxide acts as a powerful narcotic poison and the symptoms come on very rapidly after inhalation. If the proportion of the gas is high they come on immediately and prove fatal within a few seconds. The first effect of the gas on the body is to produce utter prostration and muscular paralysis so that the victim is unable to move or call for help, becomes unconscious and dies before anyone is aware of the accident. Inhaled in a more diluted form it produces headache, giddiness, nausea, impairment of vision and hearing, loss of muscular power which prevents the victim from escaping, unconsciousness and death.

The lethal effect of the gas is due to its affinity for the haemoglobin of the blood with which it combines, excluding oxygen, so that the patient dies of asphyxia. It also acts on the central nervous system and paralyses its functions. The patient should be immediately removed from the poisonous atmosphere to open air and given artificial respiration or inhalation of oxygen if that is available. Stimulants should also be given freely. Transfusion of blood is very beneficial in such cases, but it is not always possible to arrange for it in time.

Carbon Dioxide Gas. It is a heavier than air, colourless, odourless gas that is produced as a result of combustion, animal respiration, fermentation and putrefacsion of organic matter. It is also produced in large quantities in lime kilns and is present in coal mines where it is known as "choke damp." Being heavier than other constituents of the atmospheric air, it tends to collect in deep wells, sewers, cellars, and excavations in the earth. It is a normal constituent of the atmospheric air in the proportion of .04 per cent, but in closed, ill-ventilated and crowded rooms its proportion is much greater. It produces a feeling of discomfort when its proportion exceeds three per cent in a room occupied by people. This is due to the presence of organic matter in the expired air. Air containing it to the extent of 20 per cent can be inhaled with impunity provided the proportion of oxygen in it is not reduced below the normal. When produced as a result of combustion it is mixed with a varying proportion of carbon monoxide gas which increases its lethal effect.

It is a narcotic poison and renders the victim unconscious ; this is mainly due to the exclusion of oxygen in the respired air and starving the blood of it. In a highly concentrated form, when oxygen is absent or much reduced in proportion, its inhalation causes sudden death. The victim has a feeling of heaviness and throbbing in the head, ringing in the ears, giddiness, loss of muscular power, difficult breathing, drowsiness, coma and death.

Immediate removal to open air, artificial respiration or administration of oxygen and stimulants internally or by hypodermic injection are the measures necessary for resuscitation.

Chlorine. It is a heavy, greenish yellow gas with a pungent odour which can be recognised in a dilution of one in a million. It is very irritating to the eyes and the mucous membrane of the respiratory passages. In a pure and concentrated form it is met with in laboratories only. It is liberated from bleaching powder and is used for bleaching cotton cloth. Accidental poisoning has occurred by the escape of the gas from cylinders containing it. It was one of the gases used in the first world war. The treatment is the same as for poisoning by other gases.

Coal Gas. Coal gas used for illuminating and heating purposes is obtained by distillation of the mineral coal and is a mixture of many gases, the most important of these being, hydrogen, carbon monoxide, and marsh gas. Its poisonous property is due to the presence in it of these gases, especially carbon monoxide. Its peculiar odour gives an indication of its presence in the atmosphere. Accidental poisoning occasionally occurs and is due to leaky pipes, defective burners or carelessness on the part of the consumers. The symptoms and treatment are the same as for carbon monoxide poisoning.

Hydrogen Sulphide or Sulphurated Hydrogen. It is a heavy gas soluble in water and possessing a very unpleasant odour. It is used in the manufacture of beet sugar, artificial silk, sulphur dyes, and in many other chemical industries. It is given off by putrefying organic matter containing sulphur and is present in sewer gas. It is highly poisonous and produces very unpleasant symptoms even in a dilution of one in two hundred thousand. In a concentrated form it causes headache, giddiness, heaviness in the abdomen, loss of consciousness, coma and death. It may produce sudden collapse and death if inhaled in a very concentrated form. The victim should be immediately taken to open air and given stimulants freely. Artificial respiration and inhalation of oxygen should also be tried.

Sewer Gas. Sewer gas, as its name indicates is found in sewers and is the product of decomposition of various organic matters found in them. It is a mixture of the atmospheric air and varying proportions of carbon monoxide, carbon dioxide, sulphurated hydrogen, and ammonia. Cases of accidental poisoning occur frequently when men descend into large sewers for cleaning purposes without taking proper precautions. Leaky drains in or in the vicinity of houses are a source of danger to health if not to life. The man-hole should be kept open for a sufficiently long period so as to allow the gases to be diluted with the atmospheric air before anyone is allowed to enter. The symptoms are the same as those produced by the above-mentioned gases and the treatment is fresh air, artificial respiration, stimulants, and inhalation of oxygen.

Sulphur Dioxide. It is a heavy gas with a very pungent irritating smell. It is generated by burning sulphur or roasting sulphur-containing ores. It is much used in industry for bleaching straw, wool, bristles, oils, etc., and was at one time used for disinfecting closed rooms and for destroying vermin and insects. It is one of the gases used in cooling or refrigerating plants and is sometimes used for the preservation of fruit. It is very irritating to the eyes and air passages and its prolonged action causes inflammation of the respiratory organs and may be fatal. Cases of poisoning by this gas are very rare.

Poison Gases Used in War. It is beyond the scope of this work to deal in detail with all the poison gases used in warfare, as detailed instructions for protection against these are issued when occasion arises or when they are likely to be used against the civil population. However, a short description of these will not be out of place and may be of some use to the reader. Many chemical substances, solid, liquid, and gaseous, all described under the general term "gases," were used in World War I ; fortunately their use in the second World War was not resorted to. In this war a much worse weapon of torture and general destruction, not only of property but of wholesale civilian population, women and children, on a gigantic scale was used, viz., the atom bomb. The precedent is likely to be repeated in the future, as so far not a single civilized nation has utterred one word of protest against its use. So far no efficient method of protection against this, nor against the radio-active rays liberated by it, is known.

The poison gases are set free through the bursting of shells fired from guns or of bombs dropped from aeroplanes, or they are discharged through specially made ejectors or sprays. Their effect on the body varies according to the nature of the gas used, the degree of concentration present in the atmosphere, and the length of exposure. They are classified according to their action on the body, as blistering gases, lachrymatory or "tear" gases, respiratory or lung irritants, and narcotic gases. There are about 200 poisonous gases known to chemists, but only a few of these have been found to be suitable for chemical warfare. Chlorine was the first poison gas used by the Germans in 1915.

Blistering Gases. Two kinds of this gas were used : mustard gas and lewisite. Both are oily liquids and as their name implies they cause severe burns or blisters on the parts of the body with which they come in contact. Their power of penetration is great and as they do not readily evaporate they persist for a long time and the ground and articles contaminated by them are dangerous to touch until they are thoroughly decontaminated. The severity of their action varies according to the degree of concentration and the length of exposure. The only effective method of protection against this gas is a well fitting gas mask and a thick rubber suit covering all parts of the body. Such a dress would be very uncomfortable in hot climates. After exposure all the exposed parts should be thoroughly washed with soap and warm water and the clothes changed immediately. Particular attention should be paid to the eyes which should be washed out with warm saline solution or a solution of bicarbonate of soda, 10 grains to the ounce.

Lachrymatory or Tear Gases. There are three members of this group, one solid and two liquid. They produce an immediate irritating effect on the mucous membrane of the eyes, nose and respiratory passages, which lasts for a few minutes only. Prolonged inhalation may produce inflammation of the lungs. No special treatment is necessary as the copious flow of tears and nasal discharge wash away the poison ; only in rare cases, where the liquid is directly sprayed into the eyes, is it necessary to wash them with saline solution. In the worst cases the effects do not last longer than twelve hours. It is used to disperse the mob in street rioting.

Nasal Irritants. There are three of this group which have been used in warfare, all of which are solid and compounds of arsenic. They are disseminated by detonation in the form of very fine vapour which is almost invisible and odourless. They act immediately on the mucous membrane of the eyes and respiratory passages causing severe pain in the nose, headache, burning in the throat, a feeling of tightness and oppression in the chest, a sensation of grittiness in the eyes with profuse waterings aching of the gums, teeth and jaws, and salivation ; acute mental distres, may be present. The effects are temporary and disappear after an hour orsowithout any special treatment. Persons exposed to these gases should be immediately removed from the contaminated atmosphere and given complete rest, and their clothes removed, thoroughly brushed and aired.

Lung Irritants. There are four chief members of this group, two gases, viz., chlorine and phosgene, and two oily liquids, diphosgene and chloropicrin. Of these phosgene is more suitable for use in warfare as it is colourless and its presence difficult to detect before it has produced its toxic effects. It has a smell of musty hay which is present even in very low concentrations. Diphosgene is an oily liquid with a high boiling point (262° F). On release it forms a colourless vapour and has the same smell as phosgene. Chloropicrin is a yellow liquid which boils at 232° F and has the same smell as chlorine, but is more irritating to the eyes and air passages.

Immediate removal of the patient from the contaminated atmosphere to fresh air, complete rest in bed, as exertion aggravates the trouble and might turn the scales against the patient, removal of the clothing as soon as possible, and inhalation of oxygen, are necessary by way of treatment. The patient should be given plenty of warm drinks. Venesection, followed by intravenous injection of saline, is very useful.

SHOCK. The term is applied to a condition of depression of the vital functions of the body that is brought about by severe injury, excessive bleeding, or sudden mental or emotional disturbance found in fright, anxiety, etc. It is also found in severe toxic conditions of acute infectious diseases. It is aggravated by any condition that lowers the vitality of the body, such as exposure to cold, fatigue, want of food or sleep. Deep wounds, and crushing or extensive superficial injuries are very likely to cause it. If at the time of the accident the attention of the injured person is diverted to other matters as happens during the excitement of a battle or an accident, or when he is under the influence of alcohol, very severe injuries may be unattended with pain or shock and he may be able to render help to others, but when the excitement or the effect of alcohol is over, the reaction sets in with greater severity on account of the energy expended.

Its severity varies according to the nature and extent of the injury and the physical, mental and emotional make-up of the patient. Usually it develops rapidly after the injury. The face becomes pale, skin cold and clammy, cheeks hollow, eyes sunken, respiration shallow and sighing, temperature subnormal, and pulse hardly perceptible. The patient is in a state of prostration and apathy from which he is roused with difficulty. Except in very severe cases, reaction sets in within a few hours and may be ushered in by vomiting and return of consciousness. The colour of the face improves, the skin becomes warmer, the temperature rises, the pulse and respirations return to normal and the patient asks for a drink. The shock may be so severe as to cause death without the return of consciousness.

In mild cases nothing more than complete rest in the recumbent position is needed. The patient is to be kept in bed covered with blankets and prevented from getting up. If found lying in the middle of the road he should be removed to a safe place, care being taken to carry him in a horizontal position with the head on a lower level than the rest of the body so as to ensure proper blood supply to the brain. All constrictions round the neck and chest should be removed and the clothing loosened so as to allow free movements of the chest. Gentle rubbing of the limbs to stimulate circulation, administration of stimulants by the mouth, or by the rectum if he is unable to swallow, are indicated by way of treatment. Stimulants should not be given if bleeding is present and until it is completely stopped otherwise the condition is likely to be aggravated. The patient's head should be kept on a lower level than the rest of the body by removing the pillow from under his head and raising the foot of the bed.

SNOW BLINDNESS. Prolonged exposure of the eyes to the glare of the snow produces an inflammatory condition of the eyes which may be followed by temporary or sometimes by permanent blindness. The trouble commences with lachrymation, hypersensitiveness to light, inability to open the eyes, followed by inflammation of the cornea and conjunctiva. The condition is temporary and usually disappears after a few days of rest without leaving any ill effects behind ; but in some sensitive persons, or after a prolonged exposure, the symptoms persist for a long time and may cause permanent damage to the eyesight. The preventive treatment consists in wearing dark glasses during prolonged exposure to the glare. When the symptoms have developed the eye should be given complete rest by remaining in a dark room, and cold compresses applied to the eyes. If the pain and burning are very severe and persistent it is necessary to instil a few drops of cocaine solution into the eyes.

SUN BLINDNESS. Sun blindness is caused by the exposure of the eyes to direct rays of the sun. This accident is common during a solar eclipse among persons who try to observe it with unprotected eyes. The severity of the symptoms depends on the intensity of the light and the length of exposure. Immediately after the exposure dark spots appear in the field of vision which may obscure the whole field. Objects are seen distorted or revolving. The symptoms are persistent and often result in permanent blindness or diminished vision. Complete rest to the eyes in a dark room is the most important part of treatment. Dry cupping on the temples, application of a constant electric current and injections of strychnine solution are beneficial. By way of prevention the eyes should never be exposed to direct light of the sun, a piece of glass smoked on one side affords sufficient protection for observing the eclipse.

Ordinary electric light used for illuminating purposes resembles mild sunlight and does not produce any harmful effect on the eye. It has many advantages over kerosene oil and gas used for the same purpose. Strong arclight and the light given off in electric welding are harmful and may cause permanent damage to eyesight and require the same protection as for sunlight.

SPRAINS. The term sprain is applied to an injury sustained by a joint in which its ligaments and tendons are damaged without any dislocation of the bones. It is caused by a sudden and violent twisting or wrenching of the part as might happen while running or playing games. The symptoms are rapid swelling, pain and disablement of the limb and tenderness over the damaged ligament. There may be signs of bruising and bleeding under the skin. The pain is severe and is aggravated by movement and can be elicited by pressure on the part. The ankle, knee, wrist and elbow are very liable to this kind of injury.

The treatment consists in applying cold to the injured joint and surrounding parts as soon as possible in order to prevent swelling and pain. This can be done by cold compresses, application of ice, pouring ice-cold water on the part or one of the evaporating lotions (No. 42) constantly kept on it. The cold application is to be continued for an hour or so, after which the joint is covered with cotton wool and bandaged. Pain and swelling are reduced by gentle massage morning and evening for a few minutes and rest in an elevated position. A soothing liniment (No. 37) rubbed on it will also relieve pain and help to reduce the swelling. Tuberculosis is likely to attack old sprained joints, especially in debilitated subjects.

STRANGULATION. Strangulation means the arrest of respiration by a constriction applied round the neck or by throttling. The suspension of the body also causes strangulation. In judicial hanging the body is given a drop from a height which causes the fracture or dislocation of the first two vertebrae and sudden death from injury to the uppermost part of the spinal cord. In strangulation death may take place suddenly from shock but usually it is due to asphyxia in which case there are convulsions, swelling of the face, protrusion of the tongue, and bleeding from the nose or mouth. Strangulation is usually suicidal in which case the body is suspended ; in children accidental strangulation from suspension has occurred.

In most cases of suicidal or homicidal strangulation death takes place very rapidly and the victim is beyond the reach of any help. The treatment consists, in case life is not extinct, in prompt removal of the constriction, briskly rubbing the limbs to promote circulation, administration of stimulants—alcohol, ether, hot coffee or whatever is handy—and keeping the patient in bed with hot water bags. Even after resuscitation he is not free from the risk of inflammation of the respiratory organs and requires rest and careful nursing.

UNCONSCIOUSNESS. Unconsciousness is a symptom found in many conditions. Occasionally a person is found lying on the road and no history as to the cause of unconsciousness is available. It may be due to one of many causes and to render first aid it is necessary to have some idea of these and to differentiate between them which is not always an easy matter. Unconsciousness may be due to : (1) Concussion or other injury to the brain. (2) Apoplexy. (3) Alcoholic or narcotic poisoning. (4) Sunstroke. (5) Epilepsy. (6) Coma of diabetes or uraemia. The last can be ruled out as such a patient is not likely to be found on the road. In order to find out the cause the following points should be noted : (1) The signs of any injury on the body, as in concussion there may be signs of an injury to the head, face or other part of the body, but the absence of such injury does not exclude concussion. (2) The appearance of the patient and the colour of the skin. In alcoholic poisoning, sunstroke, and apoplexy the face is usually flushed ; in narcotic poisoning it is pale or livid. (3) The pupils. These are dilated in alcoholic and dhatura poisoning, dilated and unequal, *i.e.*, one larger than the other, in apoplexy, and very much contracted in opium poisoning. (4) Breath. The smell of alcohol, opium, or other drugs may be found in the breath. The smell of alcohol does not necessarily exclude other conditions, as a person feeling unwell might have taken alcohol by way of treatment and might have got a stroke of apoplexy or sunstroke after the drink. Even concussion of the brain cannot be excluded as alcoholic subjects are very liable to street accidents. (5) Respiration. It is noisy in alcoholic poisoning, laboured and stertorous in opium and narcotic poisons, and sighing in concussion. (6) Pulse. It is full and bounding in alcoholic poisoning, feeble in concussion, small and irregular in opium, and full and slow in apoplexy. (7) Skin. It is flushed in alcohol, pale and cold in opium and narcotics, pale in concussion, and flushed and dry in sunstroke. (8) Muscles. In apoplexy they are flaccid on one side of the body. (9) The degree of unconsciousness. In alcohol and opium poisoning, unless the condition is far advanced, the patient can be roused by shouting, but in other conditions this cannot be done. (10) Temperature. In sunstroke it is above normal and may be very high and in concussion it may be subnormal.

The first aid and the line of treatment depend on the cause responsible for the condition these are described under different headings. If found lying in the middle of the road he should be removed to a safe place and no attempt should be made to make him get up or walk as is usually done. All bands and clothes round the neck and chest should be loosened and when he is removed he should be carried in a horizontal position, the head being on the lowest level.

WOUNDS. Wounds are classified as incised, lacerated, punctured, gunshot, and poisoned. An incised wound is clean cut and inflicted with a sharp instrument; it heals readily provided all infection is excluded. It bleeds freely, the bleeding depending on the size and number of vessels cut and the vascularity of the part, being very profuse from wounds on the face, scalp, and mucous membranes. A lacerated wound is one in which there is much damage to the soft parts and which is inflicted with a blunt hard weapon. Bleeding from such a wound is limited as the blood vessels are torn and crushed. Such wounds are always badly infected and slow to heal and are accompanied with shock which may be severe enough to end in death. Punctured wounds are inflicted with sharp pointed instruments and are very dangerous as they cannot be properly cleaned or disinfected. Tetanus is a common complication of such wounds, especially if inflicted with a rusty nail. A wound from a fish hook is very troublesome on account of the barb which gets caught in the soft tissues. It can be easily removed by pushing it forward through the skin after it is detached from the line, and the wound disinfected with tincture of iodine or carbolic acid. A poisoned wound is inflicted with an arrow or other weapon that is coated with some poison. Snake-bite is a poisoned wound.

The treatment consists in cleaning the surrounding area, disinfecting the wound and covering it with clean surgical dressing. It is covered with a piece of gauze or cotton wool soaked in an antiseptic lotion and the surrounding area washed with soap and warm water, the wound is then thoroughly cleaned with an antiseptic lotion covered with gauze soaked in the lotion, and cotton wool, and bandaged. In case of a clean incised wound an attempt should be made, after it is disinfected, to bring the edges together and keep them there with a strip or two of adhesive plaster before bandaging. In all deep punctured or lacerated wounds, especially when there is a possibility of contamination with garden earth or road dust, it is very necessary for the patient to undergo protective inoculation against tetanus and gas gangrene.

BANDAGING

Bandages are used for holding surgical dressings on wounds, for fixing splints to limbs, for applying pressure to a wound to control bleeding, or for supporting a part. In order to do this efficiently it is necessary to have some knowledge of bandaging which can be acquired easily with a little practice. There are many kinds of bandages, *viz.*, roller, triangular, four-tailed, many-tailed, etc., according to their shape, as shown in figures 22 and 23. These are meant to be applied to different parts of the body, but they are not likely to be available in an emergency, and

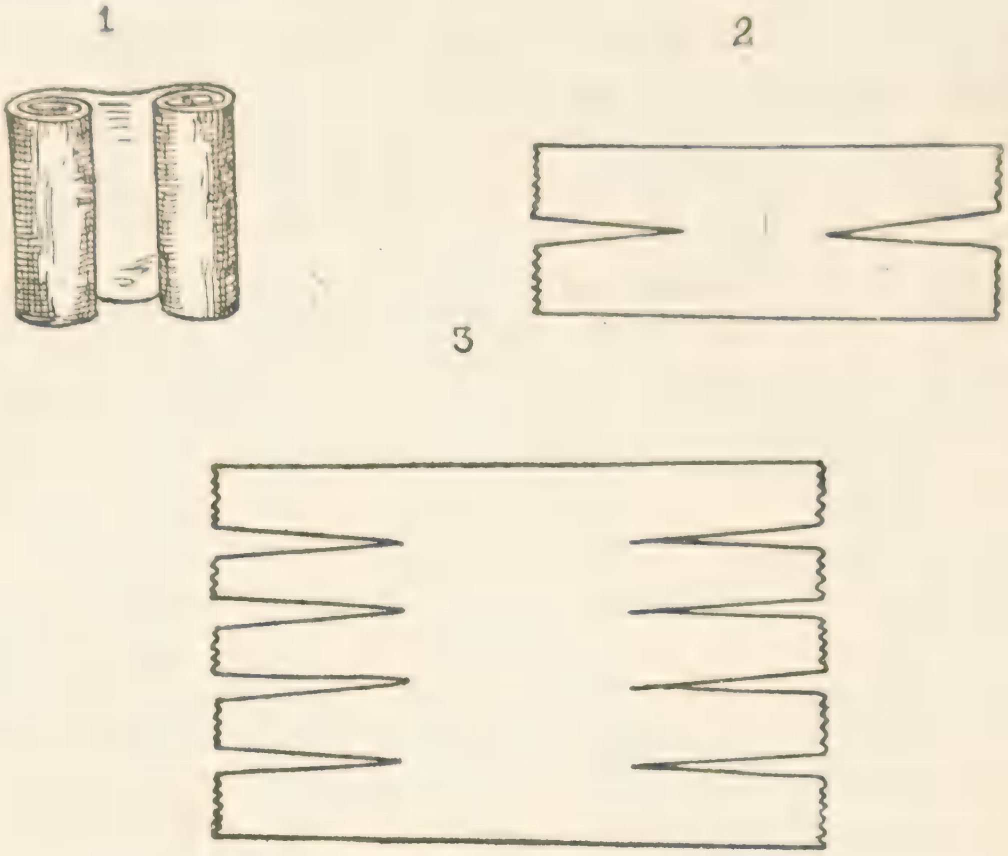

FIG. 22
Bandages : 1 Double-headed roller, 2 four-tailed, and 3 many-tailed.

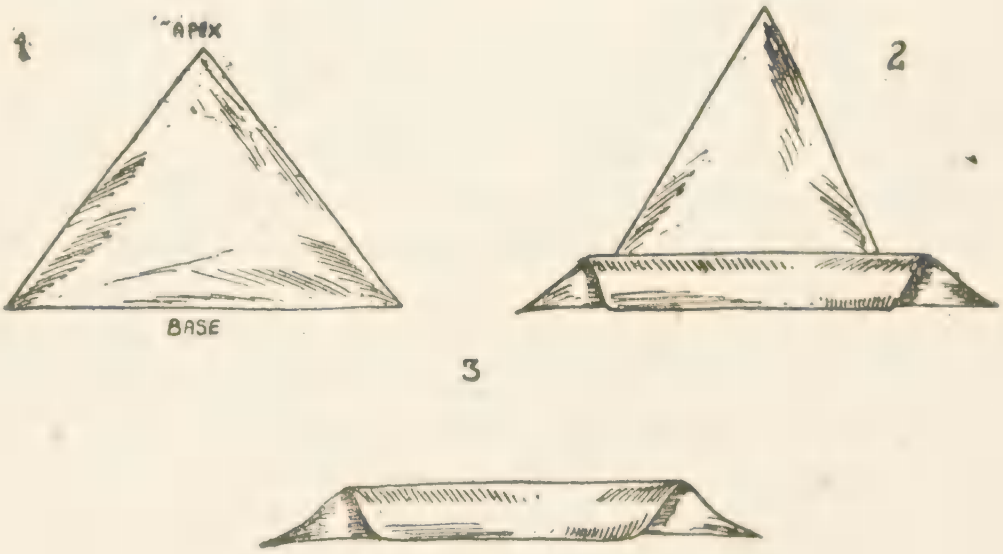

FIG. 23
Triangular bandage.

for all practical purposes the triangular bandage can be conveniently used for first aid. It can be easily made from a piece of cloth, having base not less than 42 inches long, or a large handkerchief folded over may be utilized. A reference to the illustrations will enable the reader to understand more easily the different methods of applying the bandages than elaborate written instructions.

A roller bandage is made up of a strip of cloth from 2 to 3½ inches wide according to the thickness of the part to be covered, and from 2 to 6 yards long. Any clean white cotton material may be used, but commonly loose woven cotton fabric, which is firm, fairly elastic and cool is used for the purpose. Unwashed calico is not suitable except when applied over splints, but it may be used in an emergency. Ready made bandages of different sizes and materials are available in the market. Flannel bandages are used for warmth, but they are uncomfortable in warm climates. Elastic webbing, perforated rubber and other material are also used for special purposes, *viz.*, applying pressure to joints or supporting swollen or varicose limbs.

While applying a bandage the following points should be carefully noted : (1) that the limb is evenly and uniformly covered with sufficient cotton wool. In case of a septic suppurating wound cotton wool impregnated with some dry antiseptic powder should be used ; (2) that to start with, the outer surface of the bandage is applied to the dressing so that the bandage can be easily unrolled in the hand as it is being carried round the limb as shown in figure 24 ; (3) that the end is properly secured so that it cannot be pulled out after the bandage is applied. This can be done by putting the end obliquely on the limb and carrying a couple of turns over it so as to bury it under them ; (4) that the bandage starts from the inner surface of the limb, as shown in figure 24 so that the roller is carried from within outward ; (5) that all projections and bony points are well padded with cotton wool, or are excluded from the bandage so that no pain or discomfort is caused to the patient ; (6) that uniform pressure is applied to the whole length of the limb bandaged so that the bandage, when completed, looks neat and even and no part is unduly pressed ; (7) that the bandage is not so tightly applied as to stop the circulation in the part. To make sure of this the pulse on the distal side of the bandage should be felt ; (8) that if the bandage is improvised from a piece of cloth, the selvedge is removed ; and (9) that after finishing the bandage it is tested to see if it is securely applied. This can be done by gently pulling some of the turns to make sure that they cannot be easily pulled out.

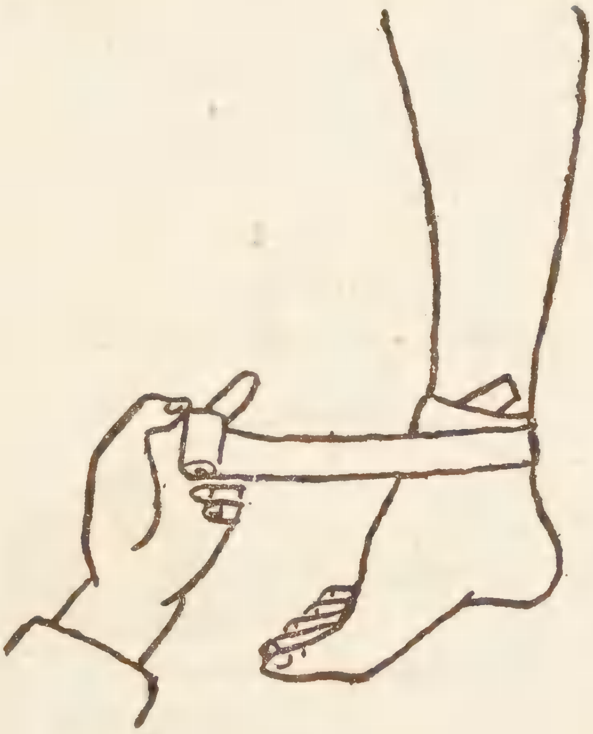

FIG. 24

Fixing the end of the roller bandage before bandaging the limb.

The head can be bandaged by a triangular, four-tailed, or double-headed roller bandage. The triangular bandage is folded at the base so as to form a hem about two inches wide as shown in figure 23-2 ; the centre of the hem is applied to the forehead and the body of the bandage thrown over the head so that the apex hangs behind. The two ends of the hem are taken round the base of the head over the bandage and tied in front. The apex is pulled down a little so as to spread the bandage evenly and exert a little pressure on the dressings ; it is then turned up and fixed by means of a safety pin (Fig. 25). A four-tailed bandage is

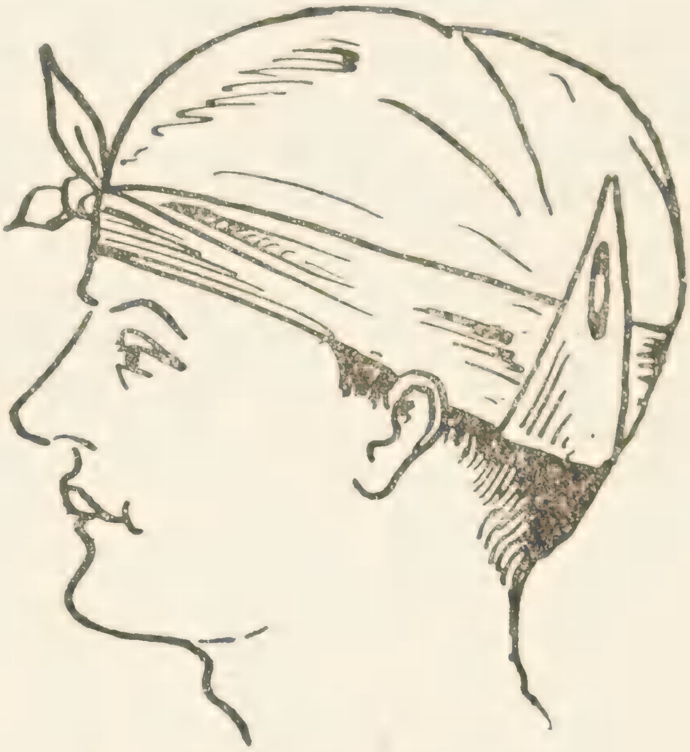

FIG. 25
Triangular bandage applied to the head.

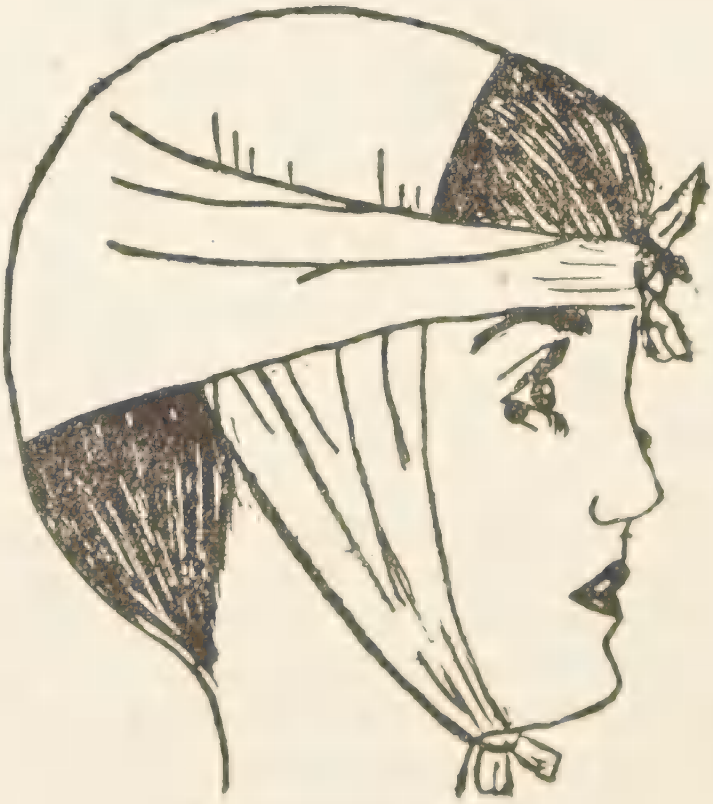

FIG. 26
Four-tailed bandage applied to the head.

just as easy to apply and can be improvised from a piece of cloth about 32 inches long and 12 inches wide. The bandage is placed on the head so that the tails hang on either side; those in front are tied together below the lower jaw and those behind are brought forward and tied in front of the forehead (Fig. 26). A double-headed roller bandage (Fig. 23-1) which can be prepared by stitching together the ends of two roller bandages, may be used for bandaging the head. It covers the whole area and exerts a uniform pressure, but its disadvantages are, that it requires some skill to apply properly, which can however be acquired with some practice; that it is uncomfortable in hot climates, and that it is liable to come off unless properly applied. The rolls are taken, one in each hand, the intermediate or the stitched part being held firmly against the forehead just above the eyebrows; the rolls are then carried to the back of the head, one on each side to as low a level as possible. The left one is carried round the head and brought to the front forming a complete circle, while the right one is brought to the front over the top of the head in the middle line where it is held and the left one is carried over it to the back; it is then taken to the back a little to one side of the middle line and overlapping about a third of the first turn. While coming forward it overlaps the other side. The process is continued until the whole of the head is covered when both the ends are pinned. The method will be easily understood by a reference to figure 27.

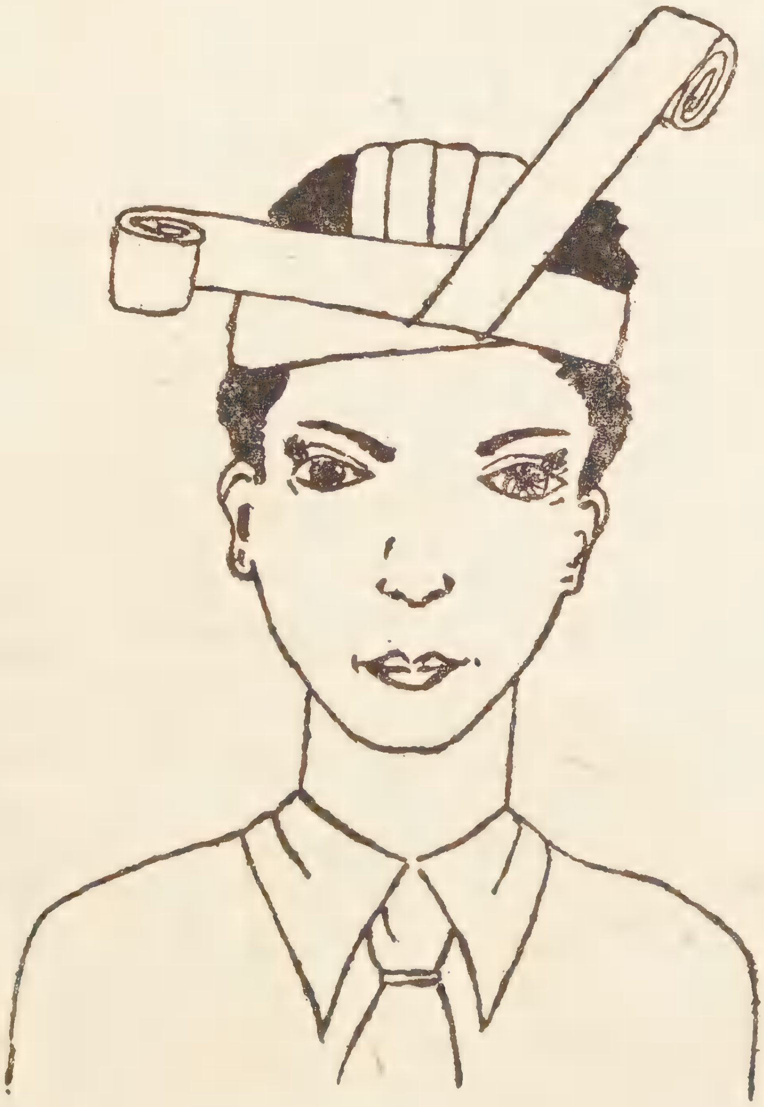

FIG. 27

Method of applying double-headed roller to the head.

The triangular bandage can be used for bandaging the limbs and joints provided the area to be covered is not extensive. For this purpose it is folded to form a long strip about three inches wide (Fig 23-3), wrapped round the limb and secured by knotting the ends together. But a roller bandage is more suitable when a large area on a limb is to be covered. When the diameter of the limb is more or less uniform the spiral method of bandaging is very convenient. In this, after the end of the bandage is fixed as shown in figure 24, the roll is carried round the limb in a spiral, each turn overlapping about a third of the previous one until the whole of the limb is covered. The end is then fixed with a safety-pin, or it may be split longitudinally and the strips taken round the limb, one on each side, and knotted together.

Where the diameter of the limb is not uniform the figure of eight method is very suitable. The end is fixed as before by taking one or two turns round the limb, the roll is then carried upward in front a little obliquely to the opposite side and round the limb, from here it is brought down to the orginal level to the other side crossing the first turn, thence round the limb back to the starting point thus making a complete figure of eight. The process is repeated, each turn overlapping about a third of the previous one until the whole area to be bandaged is covered. A reference to figure 28 will show the method of application to the forearm, leg and ankle.

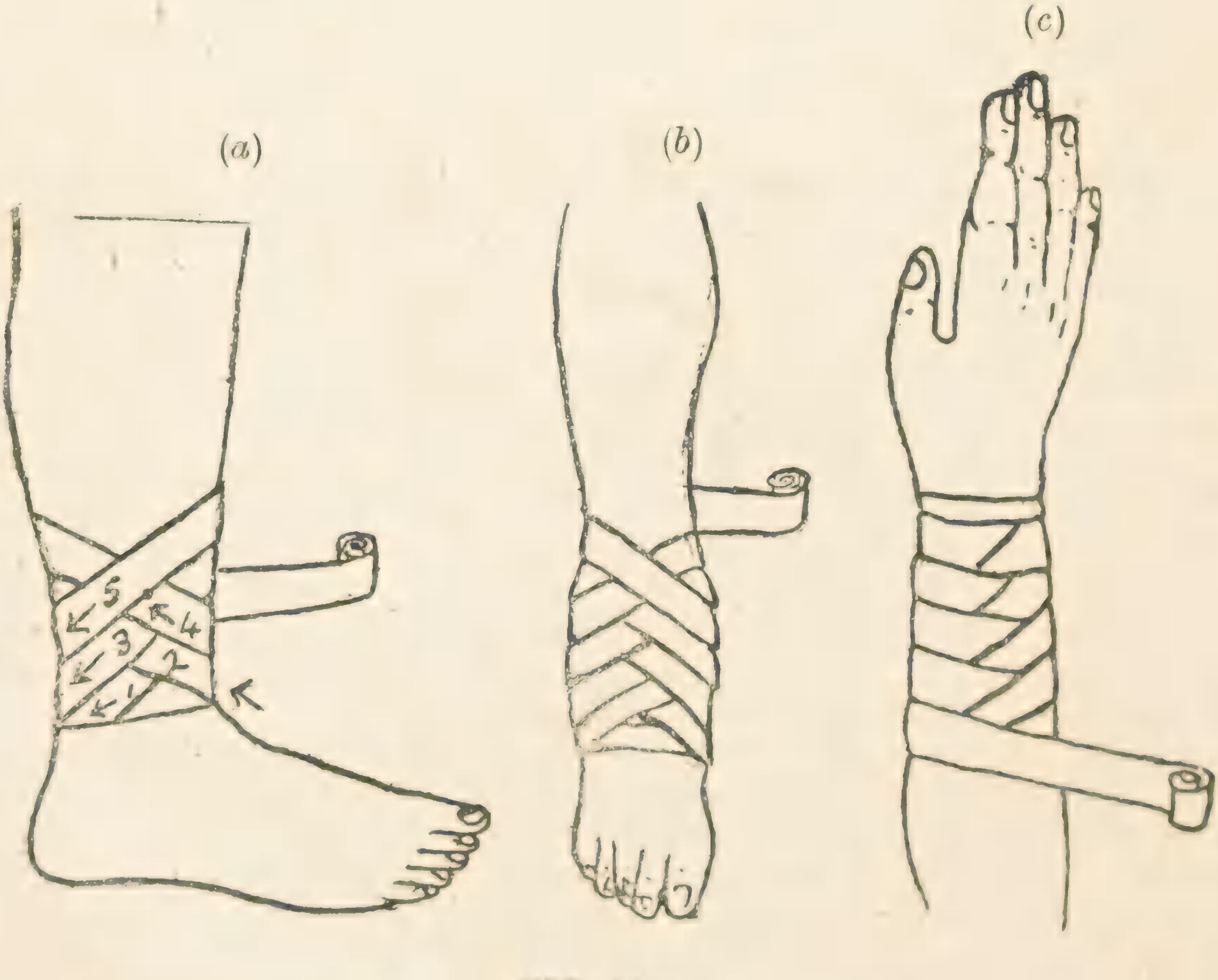

FIG. 28

Method of applying figure of eight bandage to *a* leg, *b* antlo and *c* forearm.

CHAPTER 9

INSECTS AND INSECT BITE

Insect bites are not only irritating but may be the means of introducing dangerous diseases into the human system. Non-biting insects might carry disease microbes mechanically to human food, the most familiar instance of this being the common house fly that is responsible for disseminating the infection of typhoid, cholera, dysentery and diarrhoea. Larvae of flies, commonly known as maggots, may develop in open unclean wounds, suppurating nostrils and ears. Though the actual injury inflicted by the bite of an insect is very trivial it is likely to be dangerous on account of the infection conveyed by it. A brief description of some of the important ones and the diseases conveyed by them are given here.

HOUSE FLY. The house fly is one of the most widely distributed insects and plays a very important part in spreading many diseases, such as typhoid, cholera, etc., though it is not a biting insect. Its habits are very filthy as it feeds on human excreta and pathological discharges containing disease germs which stick to its legs and body, and these are transferred to human food on which it vomits and defecates while feeding. Sweets, milk, jam, sugar, etc., which are very good media for the growth of germs, have a special attraction for flies. In India they are very troublesome in the early part of the monsoon as the warm moist climate is very favourable for their breeding.

The female lays her eggs in stable manure, human excrement, and decaying organic matter which provide food and shelter to the larvae. The horse manure is used so long it is fresh and not more than twenty-four hours old, and unless fresh quantity is added to it, no more than the first lot of eggs is deposited on it ; the old collection, which is used once, is not used a second time. Several females collect when a suitable medium is found and lay their eggs in small crevices on the surface. A single female lays about 150 eggs at one time and repeats the performance about six times during her life. The eggs, when seen under a magnifying glass, look like small white oval bodies. Within twenty-four hours tiny white maggots hatch out from them and immediately burrow themselves to a depth of six inches where they grow rapidly in size. It takes from three to five days for a larva to grow to full size ; it then comes to the surface and passes into the next stage, that of chrysalis, which is about quarter of an inch long and of a brick red colour ; this changes to black when the fly is fully developed. The young fly bores its way to the surface where it rests for a while before flying away. In winter the time taken for its development is much longer.

The house fly serves no useful purpose, and it is not only a nuisance, but is a positive menace to health and is responsible for thousands of deaths annually. Every attempt should, therefore, be made to keep its number down as much as possible. Knowing its life history and habits the matter is not difficult. The health authorities should take more energetic measures to educate the public and seek their co-operation. Horse manure, kitchen refuse, and all decaying organic matter should be deposited in properly covered bins which should be thoroughly emptied every day, and all privies made fly-proof so that the flies do not have an access to the pans. In farm-yards and stables, where the collection of manure is large and cannot be removed daily, it should be closely packed in deep pits and well beaten down and the top covered with planks or galvanized sheets. This conserves the heat generated by the fermentation in the manure and kills the larvae. They can also be killed by treating the top layer with borax powder or D.D.T. spray. The open roadside refuse bins provided by Municipalities serve as very fruitful fly breeding centres, as they cannot be thoroughly cleaned every day and the surrounding area is kept permanently soiled with every kind of decaying matter, due to the ignorance and apathy of the public.

There are many methods of killing the adult fly ; but no matter how many are destroyed their number cannot be reduced appreciably as long as they are allowed to breed freely. The means employed for this purpose are fly-papers, poisons, traps, fly-flaps, and sprays. The fly-paper is easy to use. It has a sticky surface which attracts flies and prevents them from flying away, the poison in the mixture killing them. The sticky mixture can be prepared by mixing 27 ounces of powdered rosin in 12 ounces by weight of castor oil and warming the mixture over a fire without allowing it to boil, until the rosin is dissolved completely. When cool an ounce of honey is mixed with it. The mixture, thus prepared, keeps indefinitely if stored in a closed tin. It is warmed when required for use and applied thinly to a sheet of sized or glazed paper. Crude or country castor oil or rape seed oil may be used in the mixture.

Many chemicals are used as fly poison, but the two, that are very effective and simple to use are formalin and salicylate of soda. One to two tablespoonfuls of formalin, or two drachms of salicylate of soda with two tablespoonfuls of sugar dissolved in a pint of water are used for the purpose. A pad of cloth or several layers of blotting paper soaked in the above fluid are exposed in a plate. To prevent the pad drying a glass filled with the fluid is inverted over it ; a thin match inserted between the blotting paper and the glass will allow air to enter and the fluid to come out. Another simple method is to fill an empty cigarette tin with the fluid and through holes made in the lid several fairly thick cotton wicks are passed, the ends of which are allowed to hang out from the top. Several such tins or plates are exposed in different parts of the house. Spraying fluids only keep the flies out of the room for the time being, as they return as soon as the atmosphere is clear. Very concentrated solutions are required to kill them, that are irritating to the air passages if inhaled by human beings. D.D.T. solution sprayed on furniture and other surfaces where they sit is effective in destroying them. Fly flaps of various kinds are available, but those made of wire gauze are useful and less painful when used against flies perched on one's nose or ears. Fly traps with mechanical devices are not very satisfactory as they soon get out of order, require frequent cleaning, and the number of flies caught in them is not considerable.

Even a single fly sitting on human food is dangerous. It is, therefore, very necessary to protect all food and drinks from the flies. This can be easily done by means of gauze covers with wire frames which can be made at home economically.

HORSE or *CATTLE FLY*. This fly does not ordinarily bite human beings, but is very troublesome to horses, cattle, and dogs, and is responsible for conveying some animal diseases to them. They can be kept away from animals by repellents or insecticide sprays, preparations of coal tar being very effective for the purpose. The fly breeds in the vicinity of stables and cattle sheds, in dark and shady places. Exposure to sunlight, or washing the place with a strong antiseptic solution destroys their larvae.

TSETSE FLY. There are many varieties of biting flies which cause irritation of the skin, but very few of these are known to transmit diseases to human beings. Tsetse fly, which is a biting fly found in many parts of tropical Africa, is responsible for transmitting trypanosomiasis, i.e., sleeping sickness. It infests horses, cattle, and wild game, and in some parts of the country its ravages have been so extensive that all cattle and wild game have been destroyed, and large tracts made quite uninhabitable for human beings. It breeds in dry shady soil, where the female deposits her eggs and the larvae burrow two inches below the surface. They come out after a month as fully developed flies. Both the male and the female convey the disease. The preventive measures consist in avoiding, if possible, tsetse infested localities, or protecting exposed parts of the body by suitable clothing and insect repellents.

CANTHARIS or *BLISTERING FLY*. It is also known as the Spanish fly and is not a biting insect, but its body contains an irritating substance known as cantharidin which is used in medicine as a blistering fluid. There are several varieties of the insect, which is really a beetle and not a fly ; in India it is very common during certain seasons. It does not bite and is harmless unless accidentally squashed on the skin when it produces irritation and blisters. Rubbing a little fresh vegetable oil and washing with soap and water allays the irritation.

SAND-FLY or PHLEBOTOMUS. It is a tiny mosquito-like blood sucking insect that is found in many tropical and Mediterranean countries, being very prevalent during spring and early summer. It transmits sandfly fever and dengue, and is suspected of carrying the infection of the oriental sore. It is very active at night and produces harmful effect on the health by constantly disturbing the sleep. It is very small in size, its body being 1/10th of an inch long. It can therefore easily pass through the ordinary mosquito net which has about 16 holes to an inch, a finer one being very uncomfortable and stuffy in hot countries. The female lays her eggs in deep crevices and fissures in floors and walls in dark corners, as sunlight and very damp or dry soil destroy the larvae. A new-comer to a place infested with them is very susceptible to the bite. Protecting the exposed parts of the body with suitable clothing and insect repellents, the use of a net with very fine meshes, and spraying the floor and the walls with an insecticide are the preventive measures to be used against it.

MOSQUITO. Mosquitoes are classified into five different varieties according to their physical peculiarities. Three of these are important from the health point of view, *viz*., anophele, culex, and stegomyia. Apart from their irritating bite and interference with sleep, they are responsible for transmitting diseases. The anophele conveys malaria and filariasis, culex is responsible for filariasis, and stegomyia for yellow fever. Only the female of the species transmits the disease as the male is smaller and lives on plant juices only. The female lays her eggs on the surface of any large or small collection of stagnant water. The number, size, colour, and their arrangement differ according to particular species to which they belong, and it is possible to make out the particular species from an examination with a magnifying glass. Within seventy-two hours the larvae hatch out and swim actively in water near the surface. The body of the anopheline larva, while swimming near the surface, is practically horizontal, being parallel with the surface, while a culex larva hangs in a downward direction, the tail being uppermost, as it breathes the atmospheric air through it. After seven to ten days the larva moults its skin and passes into the next stage, that of the pupa or nymph. Th s has a large globular head and a short curved tail giving it the characteristic comma-shaped appearance (fig. 29). It has two small trumpet-like tubes projecting upwards from the body through which it breathes. After two or three days the upper part of its skin splits and a fully developed mosquito emerges from the rent and rests on the surface for some time before it is able to fly away. The whole process of development from the egg to the fully developed mosquito takes from ten to fifteen days, the period depending on the temperature and the quality and quantity of food available.

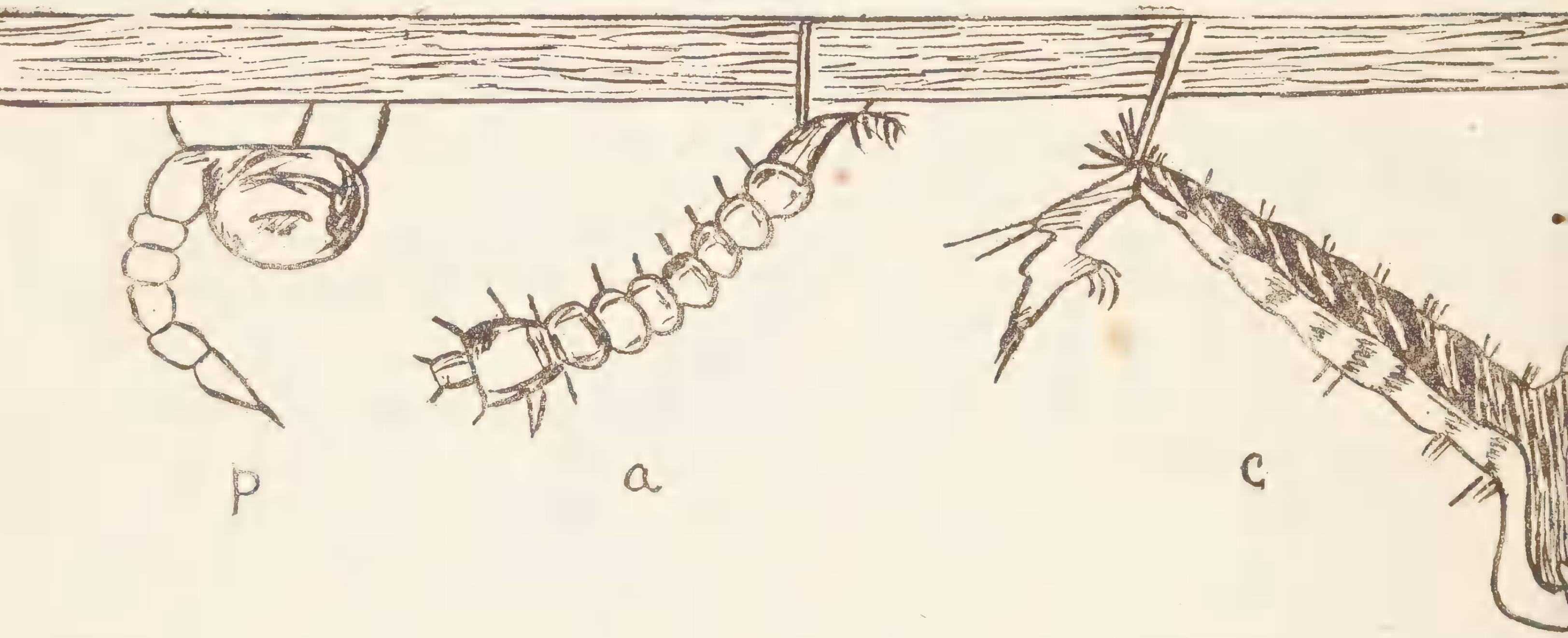

Fig. 29.

Mosquito larvae : *a*, anopheline ; *c*, culicine ; *p*, pupa.

The larvae, pupae, and adult mosquitoes of different species have different characteristics which help to identify them. This is more or less of scientific interest only, and it is immaterial for all practical purposes whether they are identified or not, as all varieties are harmful and should be destroyed wherever they are found. A simple method of distinguishing an anophele from a culex is to observe its position while resting on a surface. The former keeps its head and body in a straight line making an angle with the surface on which it rests, while the latter has its head bent on the body which is allowed to drop parallel with the surface (fig. 30).

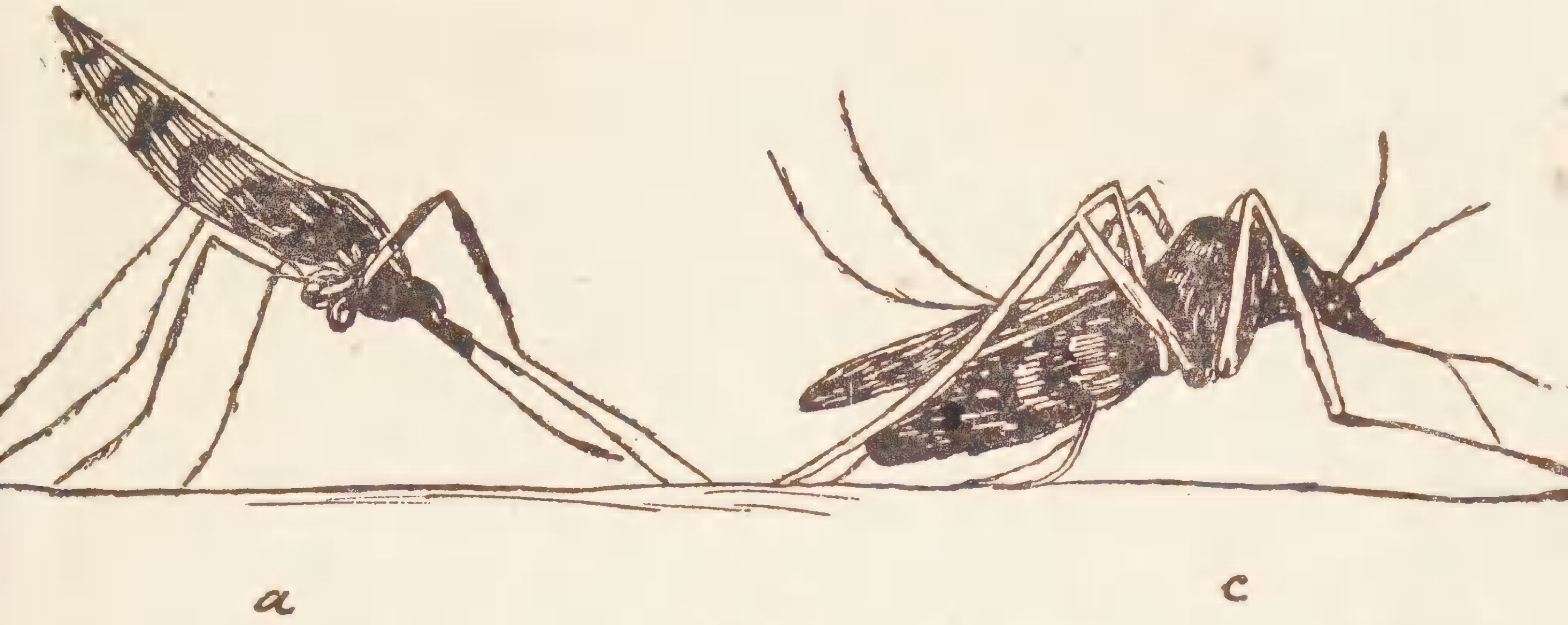

FIG. 30

Adult mosquitoes resting: *a*, anopheline; *c*, culex. Note the angle made by each while resting.

Mosquitoes rest during the day in dark corners and behind furniture and curtains and come out at night to feed and lay eggs; some of the deadly anopheles are active after 9 p.m. and go into hiding before daybreak. It punctures the skin with a sharp-pointed sucker and injects a little saliva before drawing blood. The saliva contains not only the irritating substance, but also the infection of the disease previously obtained from a person suffering from it. The malarial parasites sucked from a patient grow in its salivary glands and are passed to the next person it bites. It is therefore clear that for the dissemination of malaria, the mosquito has to get the parasite from a person suffering from the disease. For that reason the preventive measures cannot be considered complete unless the mosquito is prevented an access to the patient.

The irritation produced by a mosquito bite can be relieved by rubbing on the part a little dilute solution of ammonia, hydrogen peroxide, or a piece of soap moistened with water. A pinch of bicarbonate of sodium rubbed with a little water has the same effect.

The mosquito breeds in many unsuspected places and its larvae have been found in flower vases, tins and chatties kept under meat-safes, and during the monsoon in empty tins, broken bottles lying about the garden, hollows in trunks of trees, and any little collection of water. Its life history and habits have been studied and scientific research has discovered efficient and easy means of destroying the larvae and the adult insect, and what is now required for its complete extirpation is co-operation from the public, which can be obtained if ignorance and apathy are removed by constant propaganda. Its breeding in small collections of water can be kept under control by emptying the water every four days, and in large collections by treating the surface of water with a larvicide, crude kerosene oil being the best for the purpose. It should be poured or sprayed on the surface so that it spreads out properly, once a week. Its disadvantages are that it cannot be used on drinking water and that it is blown to one side by the wind. Finely ground Paris green powder mixed with powdered soap stone or chalk, or D.D.T.

solution is suitable for spraying on large surfaces of water. A tiny fish, known as Gambosia fish feeds greedily on mosquito larvae and can be used in large collections of water used for drinking purposes. General and individual preventive measures against mosquito and malaria are described under the latter heading.

FLEAS. The flea is a small reddish brown wingless biting insect, of which there are many varieties that differ in size, shape, habits, and their capacity to spread disease. It cannot fly but has great jumping powers and runs very fast. Different varieties infest different animals, birds, and man. They usually live on their normal hosts, but under certain conditions can manage to live on other animals. The human flea (fig. 31) is very troublesome at night, its bite being very irritating and its movements in one's clothes very annoying and disturbing the sleep. It is quiet during the day and comes out from its hiding place in the folds and seams of clothes to feed at night. Its bite leaves a small red spot which, if in large numbers, might be mistaken in children for those produced in certain infectious diseases. It is responsible for conveying typhus fever, and is suspected of carrying leprosy, erysipelas, and septicaemia. The rat flea is much smaller and is responsible for disseminating bubonic plague, which in India alone has caused the death of over ten million people since the disease was imported in 1896. When the rat suffering from plague dies the fleas leave it and infest other rats and human beings who are near at hand and convey the disease to them.

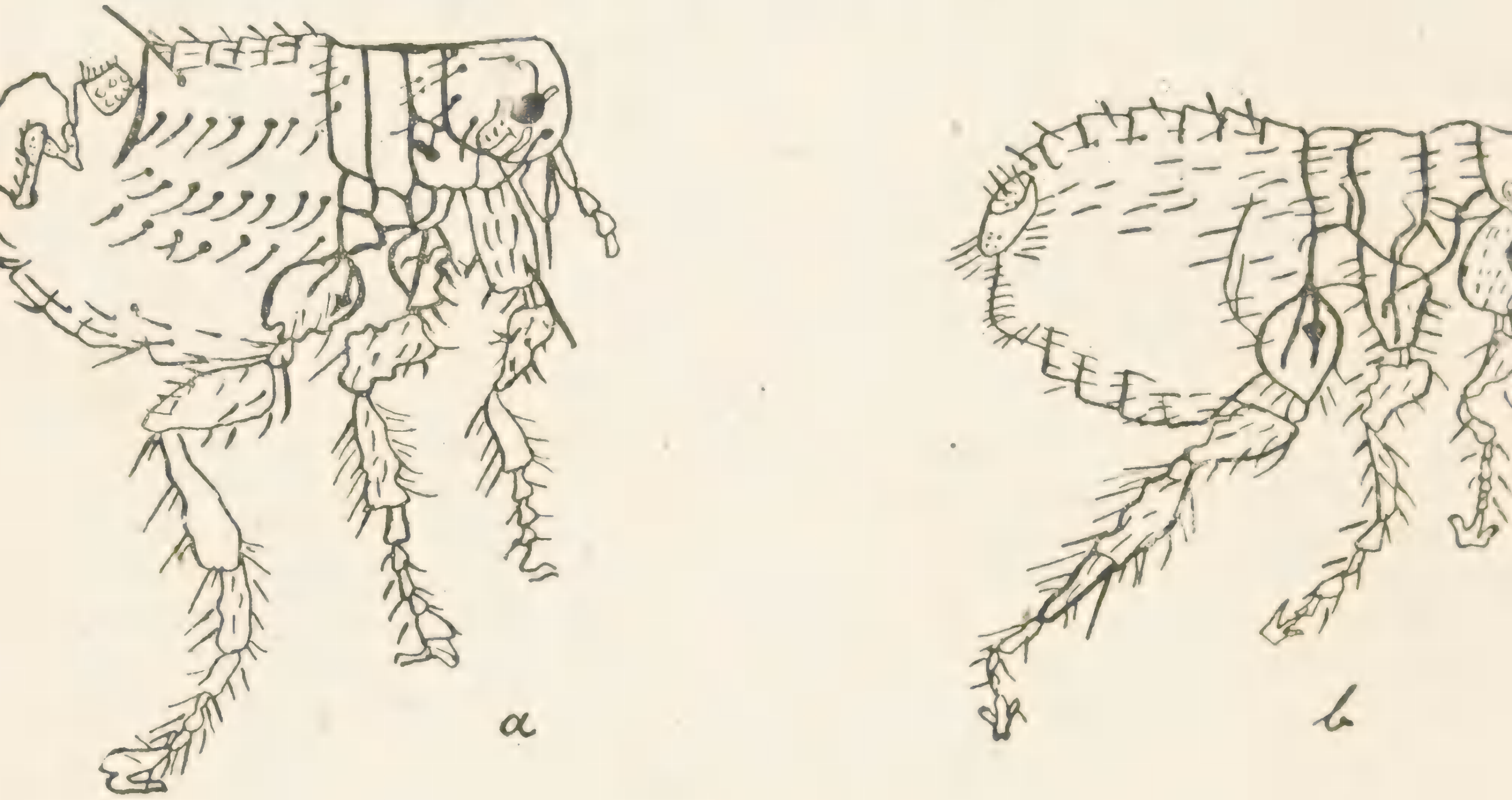

FIG. 31
Fleas : *a*, human ; *b*, rat.

Like many other insects the flea passes through four stages, *viz*, the egg, larva, pupa, and the adult insect. The eggs are laid in clothes, furniture, and in dark corners of the house. After three to eight days, the period depending on the temperature, small worm-like larvae covered with bristles hatch out and after three weeks change into pupae ; the flea comes out of it after a few days. It breeds in dust and dirt on the floor which if kept clean and sprayed with an insecticide fluid will prevent their breeding. The adults can be destroyed by boiling the infested clothes and bed linen. During an epidemic of plague all dead rats should be burnt immediately on the spot and before the fleas leave the body. As soon as a dead rat is found it should be covered with straw or other inflammable material, soaked in kerosene oil, and set on fire. If it cannot be burnt on the spot it should be dropped in a pot containing kerosene oil and taken out and burnt. All the rooms in the house should be liberally sprayed with D.D.T. solution and should not be inhabited until they are thoroughly cleaned. While visiting a plague infected house suitable clothing should be put on so as to prevent fleas having access to one's body. A pair of stockings reaching as far as the knees and soaked in some strong smelling lotion will keep them away.

CHIGOE or *JIGGER*. It is a tiny insect, the female being 1/24th of an

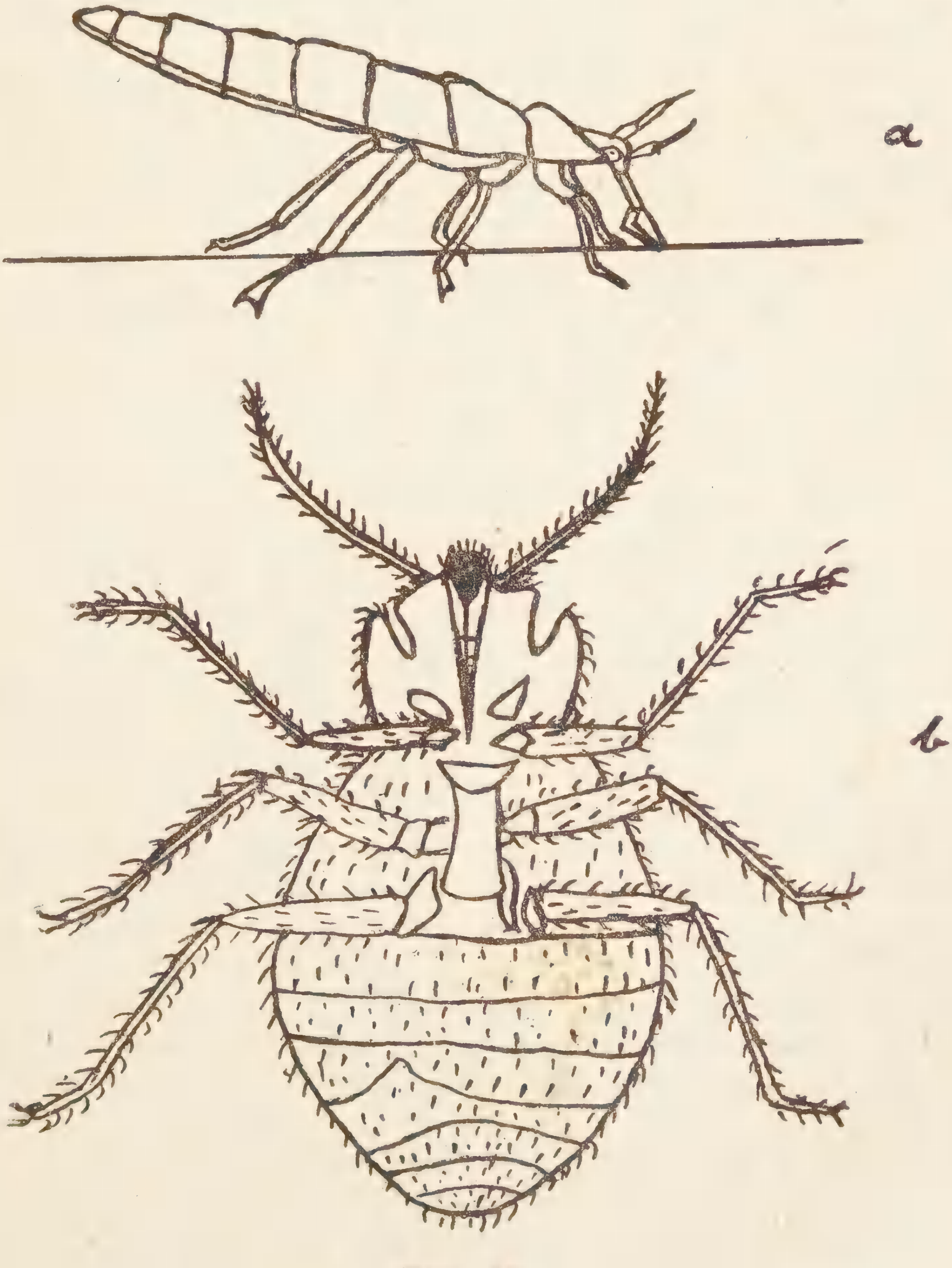

FIG. 32
Bed bug : *a*, feeding ; *b*, the ventral surface.

inch long, the male being much smaller and harmless. It is found in parts of tropical Africa and was at one time imported into India, but has not thrived in this country. The female, after being impregnated, burrows itself into the skin of the exposed parts and soon becomes distended with eggs, which are discharged on the surface of the skin and are scattered on the ground where the larvae are produced and the insect develops in dust. Persons going about bare-footed in the infested area are attacked, while those protected with boots and leggings escape. An insect repellent applied to the exposed parts of the body is an effective protection.

BED BUGS. There are many varieties of this insect which infest man, animals and birds. They differ from one another in their appearance and habits, though they are all parasitic and live on the blood of their hosts, but in the absence of these they attack other animals and birds. The common bed bug (fig. 32) is found in almost all parts of the world except the arctic region. The tropical variety found in India is of a dull red or brownish colour with a flat segmented body and a thin sharp-pointed sucker. It emits an offensive odour which is worse when the insect is crushed. It lives in holes and crevices in beds, furniture and walls, and in dusty old houses its number is enormous. It infests other houses by direct migration or in clothes, books, and furniture. It can travel a long distance from a deserted house in search of food. It uses great intelligence in search of a host and has been known to climb to the ceiling and drop from there on the victim if it is prevented to climb the bed by chatties of water under its feet. It is nocturnal in its habits except when it takes shelter in one's hat when it reverses its habits. After a good feed it can remain alive for a prolonged period, and experimentally it has survived for eight months. Its bite is very irritating after a period of fasting.

After a full meal it rests for a few days without feeding, during which period the female lays her eggs in holes and crevices in woodwork and furniture. The egg is oval in shape and when seen under a magnifying glass it shows a small ring at one end. The young one, which is like the adult in every way except the size, takes eight to ten days to hatch out, and immediately proceeds in search of food. The female lays about fifty eggs at a time and repeats the process about four times during the year. It has many natural enemies other than human beings, and is preyed upon by cockroaches, some varieties of spiders and red ants, but the number thus destroyed is not very great. In India kala-azar is known to be disseminated by it and also relapsing fever ; the bacilli of plague, yellow fever, and leprosy have been found in its body and in Africa the parasites of sleeping sickness. Its bite has different effects on different individuals which depends on individual susceptibility. In some a large wheal is produced, while in others there is no mark or any irritation. The irritation can be allayed by the same application as for mosquito bite.

Where large rooms and buildings are infested, fumigation with formalin or sulphur fumes is efficacious in getting rid of them. Special fumigators are available for formalin, and sulphur can be burnt in partly closed *sigris.* All doors, windows and openings are closed before commencing, and in case of sulphur all articles of metal and coloured fabrics should be removed from the room. The fumes are irritating to air passages and poisonous. They should not, therefore, be inhaled and all doors and windows kept open for some time before occupation. Small rooms can be cleared of bugs by spraying with D.D.T. or some other insecticide.

LICE. There are three varieties of the louse that infest the human being, viz., the head louse (pediculus capitis), body louse (p. corporis) and pubic louse (p. pubis) (fig. 33). There is not much physical difference between them, the head louse being darker in colour, while the other two are lighter. The pubic louse is much smaller with a square body. The body louse deposits her eggs in the clothes and sometimes in the hair. The head louse lays them on the hair to which they are firmly attached with an adhesive cement, and as they are white they are very prominent on black hair. A female lays from ten to twenty eggs a day and continues doing so for about three weeks. Normally an egg takes from five to eight days to hatch when a fully developed insect emerges from it. The young one takes two weeks to reach maturity and lay eggs. The dissemination of lice takes place by direct contact with infested persons, by using the same bed, or wearing his clothes. The conditions for its spread are very favourable in large camps in war time or during famine. The louse is responsible for spreading many dangerous diseases; the epidemic of typhus fever is proved to be spread by it. Trench fever, which was very prevalent during the war of 1914-18, and relapsing fever are also conveyed by it. The bacilli of plague and leprosy have been demonstrated in lice that have fed on the blood of persons suffering from these diseases.

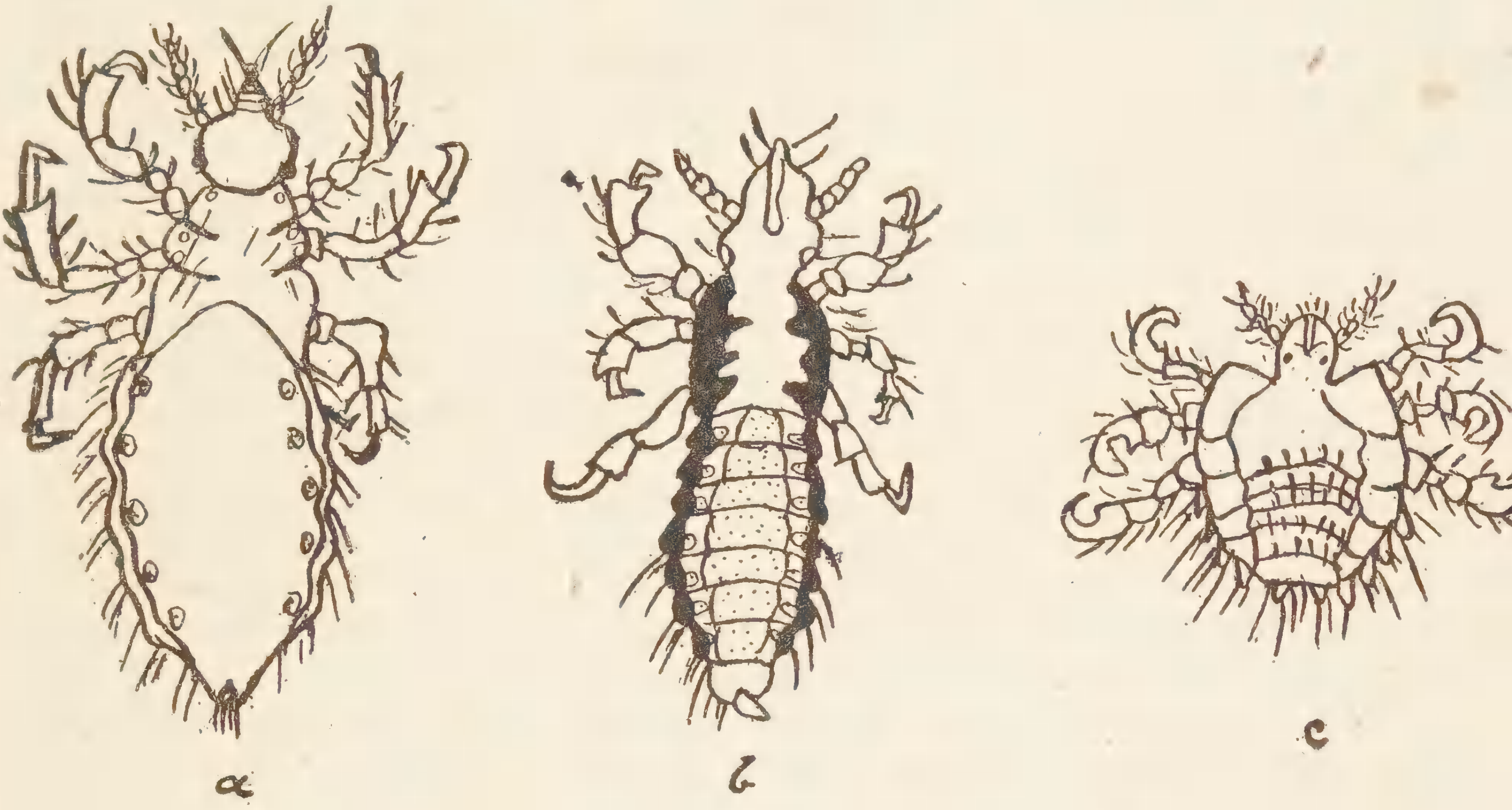

FIG. 33
Lice : *a*, head louse ; *b*, body louse ; *c*, pubic louse.

As they live and breed on the body of the host and do not infest furniture or any part of the building, except temporarily when they are dropped accidentally, the problem of louse destruction is very simple and consists in killing them and destroying the eggs deposited on the body and in the clothes. Boiling the clothes or applying heat to them is the most efficient method of delousing the clothes and bed linen. Soaking them in 3% lysol solution for an hour will kill all adult insects. If the head is badly infested the hair should be removed ; this will remove not only the eggs but the insects also. This should be followed by washing with carbolic or some other antiseptic soap. Lysol solution may be used every other day for a week or ten days on the parts, which should be washed with soap and warm water after half an hour. Underclothing impregnated with D.D.T. solution is an effective preventive, especially in camps in war time.

TICKS. There are many varieties of the tick that infest cattle, dogs, camels, and birds, but they feed on human blood when the animal host is not readily available. Their life history, habits, and their importance from the health point of view have been studied and they have been found to carry diseases, not only to animals, but to human beings also. Tick paralysis of the sheep, which is prevalent in Australia, South Africa and parts of America, is conveyed by it. Texas fever, Rhodesian fever of cattle, tick fever and malignant jaundice of dogs, and the Rocky Mountain fever in human beings which resembles typhus fever are all transmitted by the tick. Relapsing fever and the oriental sore are also spread by it under favourable circumstances. Its bite causes discolouration, thickening of the skin, and ulceration.

The female lays about 150 eggs at a time in fissures and crevices in floors and walls. The larvae remain in the egg shells for two months after which nymphae emerge from them, resembling the adult insect, but are much smaller in size. In cold weather the process is delayed for six months before the nymph comes out. This fact is to be remembered when a badly infested house has to be cleared, as the eggs might hatch after six months and reinfest the place. It is a difficult task to get rid of them from a house where they have a firm foothold. The coat of the dog should be cleaned daily, particular attention being paid to the web between the toes, and ears, and all ticks should be dropped in strong lysol lotion or crude kerosene oil. The young ones are very small and escape detection ; they look like tiny grey points and are difficult to pick out. The following mixture has been found to be very effective in destroying them. Ten ounces of cocoanut oil, four of kerosene and one of Stockholm tar (Pix Liquida) ; this is applied with a soft rag and allowed to remain for four or five hours, after which the dog is washed with warm water and soap. The treatment is to be repeated after four days. All floors, walls and furniture should be liberally sprayed with 10% D.D.T. solution ; this is not suitable for application to the skin as it is an irritant to the skin and poisonous if frequently licked by the dog. The spraying should be repeated once a fortnight for four months. Tick-bite is treated with an application of tincture of iodine.

BEES and *WASPS.* There are few persons who have not had the unpleasant experience of being stung by one of these. A single sting, though very painful, is not dangerous unless inflicted on the tongue or throat as might happen when a fruit containing a hidden wasp is hastily devoured without inspection. In some susceptible persons a sting is followed by serious general symptoms in addition to pain and local swelling. The bee is not an aggressive insect and does not attack unless disturbed by sudden noise or violent movement, and it is possible to brush off the whole colony from a hive, provided it is done gently and without any sudden movement. The bees are attracted by flowery scents, hence persons using strong smelling toilet preparations should avoid the vicinity of hives.

When a bee stings it leaves the sting in the skin so that the poison continues to be injected for some time after it has gone, particularly if the skin is rubbed to allay the pain. The pain and swelling subside after a day or two, but in susceptible persons it causes fever, dizziness, depression, and itching of the body. In young children alarming symptoms may be produced, and in adults death has resulted from multiple stings. In dealing with a bee sting an attempt should be made to remove it without pressing so as to prevent further injection of the venom. It should not be pulled out with fingers or forceps, but should be prized out with the point of a needle which is sterilized. It is superficial and can be easily removed in good light. After it is removed the part should be rubbed with a dilute solution of ammonia, hydrogen peroxide, or a little menthol dissolved in spirits of camphor. A saturated solution of aloes in rectified spirit is useful in allaying severe pain. When shock and severe general symptoms are present from multiple stings it would be necessary to administer stimulants and remove as many stings as possible. Bee venom has been found to be useful in chronic inflammatory conditions of joints when injected locally, and is now available ready for injection under different trade names.

SCORPIONS. Scorpions belong to the same class of insects as spiders. They vary in size from an inch and a half to eight inches, the larger ones being found in tropical countries. They have a segmented body of twelve pieces, the last five of which are thinner and very flexible and terminate in the sting, which consists of a round body and a thin sharp-pointed spine with two fine openings through which the venom is injected. Scorpions feed on insects, and the larger ones on lizards and mice. They have powerful claws in front with which they firmly hold their victim and strike with the sting to kill or stupify it before devouring it. The sting of some of the large Indian scorpions is very painful and might prove fatal to infants or young children. Some persons are immune to scorpion venom and are not at all affected by it. Ordinarily the scorpion uses its sting for obtaining food, but when suddenly disturbed it strikes out in self-defence. It is viviparous, *i.e.*, it does not lay eggs but gives birth to young ones which resemble the parents. There are ten to twelve in a brood, and a female produces several such broods in her lifetime. The young ones are carried on the mother's back until they are able to fend for themselves. Even a young scorpion is capable of inflicting a painful sting.

Many simple remedies have been used for the scorpion bite, the most commonly used household remedy being the freshly cut surface of an onion rubbed on the part with a circular movement until the pain is relieved. A solution containing a drachm of menthol and a few grains of thymol in an ounce of spirits of camphor is efficacious in allaying the pain which extends to the armpit or the groin. Dilute solution of ammonia or a small quantity of bicarbonate of sodium rubbed with a little water, or the application of ice also relieves the pain. In India there are persons who cure scorpion bites by *mantras* or incantations. In such cases very probably suggestion plays a great part. One such person claims to cure any scorpion bite without saying any incantations, by drawing a five-pointed star round the sting with the point of a pencil without breaking the lines. In case of infants and young children early medical help is necessary.

SPIDERS. Spiders secrete a venom which is used for killing their prey, but it is harmless to human beings. Some sensitive persons get urticarious eruptions with mild general symptoms. A small black variety found in South America is capable of inflicting severe local injuries with pain and swelling. Ordinarily the bite does not penetrate the skin and no treatment is necessary.

RED ANTS. Most of the ants are harmless and do not bite, except the large red variety which is found in jungles and usually builds its nest on mango trees. It has a strong pair of pincers and its bite is very irritating ; it attacks viciously and in large numbers. Persons sitting up in trees for game should have a spray with D.D.T. or some other insecticide handy. The irritation caused by their bite is relieved by the application of dilute solution of ammonia.

CATERPILLARS. Caterpillars are the larval stage of some moths and butterflies. They are quite harmless except the one known as "woolly bear" caterpillar whose hair contains a poison which causes persistent irritation, swelling and inflammation of the skin. It is found in large numbers in India during the latter part of the rainy season. It seeks warmth and in doing so crawls on one's clothes and bedding. It should not be touched with bare hands as its hair easily comes off and may be conveyed to other parts of the body. The part affected should not be scratched or rubbed as it will make matters worse, but should be touched with dilute solution of ammonia. The part might be washed with soap and water to get rid of the hair. For persistent irritation and inflammation of the skin a soothing lotion (No. 48) applied several times during the day is useful.

LEECHES. There are many species of leeches which are found in almost all parts of the world. Some are aquatic and are found in ponds, streams, and marshes, while others are terrestrial and are found in abundance in jungles during the rainy season. They are parasitic and prey on animals and on man when they get an opportunity. On land they move quickly and are able to jump ; the aquatic ones swim actively in water. Their colour is dark green or brown with faint stripes on the body. Some land varieties of the leech have been used in medicine from time immemorial for the purpose of letting blood in deep inflammatory conditions, especially of the eyes or ears. In tropical jungles during rainy season they are very troublesome and do a little unauthorized blood-letting on unwary persons. Its bite does not cause any pain or irritation so that the presence of this unwelcome guest is not noticed until it drops off after a full meal when blood begins to run from the tiny wound. It continues to run for some time as the saliva of the leech contains a substance which prevents the blood from clotting ; this is an advantage when used for medical purposes for letting blood. Its jaw is triradiate in shape, hence the wound inflicted by it and the resulting scar are also triradiate in shape.

The bleeding from a leech-bite can be stopped by pressure applied with a clean pad of cotton wool soaked in some antiseptic lotion. It is not advisable to pull off a leech when one is found attached to the skin as its jaw is likely to be left behind and give trouble, or the wound likely to be lacerated and cause persistent bleeding. A pinch of common salt moistened with water and pressed on it will soon make it let go and drop off by itself. The application of tincture of iodine has the same effect, but in case neither is available it should be allowed to drop off by itself after satisfying its hunger.

The aquatic variety may cause very troublesome or fatal bleeding from the nose, throat, or stomach of cattle, horses or dogs, and occasionally of human beings, if it can manage to reach these parts. Such an accident is liable to occur in man while swimming and in cattle and dogs by drinking water from infested pools or streams. It may prove fatal from excessive bleeding or from choking of the respiratory passages.

COCKROACHES. There are many species of this insect which are named from the countries of their origin, *viz.*, Oriental, American, Australian, German, etc., though they are not solely confined to these countries but are spread all over the world. They are found in large numbers in sculleries, kitchens, storehouses, sewers, and holds of ships. They avoid light and hide themselves during the day but come out at night in search of food, and scamper away as soon as the light is switched on. They are omnivorous and eat paper, leather, book covers, hair, and prefer sweet things. They drop their excreta everywhere which has a very unpleasant odour. They migrate at night to adjoining buildings in search of food and return to their haunts before daybreak. They are known to destroy bed bugs but the number so destroyed is too small to be of any practical importance. So far there is no evidence to show that they carry any disease to human beings, yet they are capable of mechanically conveying the infection of dangerous diseases whose germs may be present in the drains and sewers. They were accused of spreading cancer, but so far there is no evidence to prove this.

The female is slightly larger than the male and deposits her eggs, sixteen at a time, enclosed in a hard capsule, in a place where food is easily available for the young ones which resemble their parents when hatched out, there being no larval stage. A female in her life-time produces twenty such capsules.

Although, so far, it has not been found guilty of spreading any disease, it is a potential danger and its presence in the house is quite undesirable on account of its filthy habits and the destruction of books, papers, etc., caused by it. Poisonous insect sprays, powders, sticky papers, and traps are used to get rid of it. Phosphorus paste, which is used for destroying rats and which is available in the market is very efficacious and convenient to use. It is thinly spread on glazed paper or on a thin slice of bread which is left at night in places visited by them. Phosphorus is a poison and the domestic animals should not be allowed an access to the bait. A mixture of an equal quantity of powdered borax and flour with a little sugar is also very effective. Another good anti-cockroach powder is made by mixing two parts of sodium fluoride and one of pyrethrum powder with a little flour and sugar. The sticky mixture used for flies is good for cockroaches also. In ships and storehouses they are destroyed by poison gases.

CRUSTACEANS. Many species of this aquatic insects are found in fresh and sea water, but with the exception of one they are not known to be harmful to human beings. This one is a fresh water crustacean known as water flea—its scientific name beng *cyclops coronatus*—which acts as an intermediate host for guinea worms. The female worm lives in the human body under the skin, usually of the lower extremities, and discharges its larvae or embryos from the ulcer on the surface, which, on reaching water, enter the body of the crustacean and when the infested water is drunk it is digested in the stomach and the embryo liberated. It travels in the body until it develops and reaches subcutaneous tissues where it produces an ulcer from where it discharges fresh embryos. These are readily destroyed by boiling the water or can be removed by straining through cloth.

POISONOUS FISH. There are certain fishes whose meat is poisonous if taken as food. The puff toad or swell fish is an instance, whose flesh and roes if eaten, produce serious and often fatal illness. An innocuous fish may become temporarily poisonous by feeding on poisonous weeds, and many cases of poisoning occurring after eating fish, which are attributed to ptomaine poisoning, are due to this cause. The symptoms are nausea, pain in the abdomen and chest, difficulty of breathing, collapse and death. In some parts of Japan eating poisonous fish is a recognized way of committing suicide.

Some fishes have fangs with which they introduce poison into the wound. Others, like the ray, are capable of inflicting severe injury with the tail which terminates in a sharp spike. Some rays have barbed spines on the tail with poison glands from which venom is injected into the wound. The electric ray is able to generate a fairly strong electric current with which it stuns its prey and protects itself against its enemies. The current may be strong enough to incapacitate a person touching it. All varieties of the shark are dangerous and can inflict serious wounds with their saw-like teeth ; some of the larger ones drag down their victims and tear them to pieces. Some fishes act as hosts of larvae of tape worms, and human beings are infested with them by eating raw or improperly cooked fish containing them.

Wounds inflicted by fishes are treated as ordinary wounds. Shock and collapse require stimulants and rest in bed. Severe or lacerated injuries require early surgical treatment.

CHAPTER 10

SNAKES AND SNAKE-BITE

There are about 1,700 different varieties of land and sea snakes, of which nearly 300, including all sea snakes, are poisonous, the rest being harmless. They are numerous in tropical countries and are absent from very cold countries and at heights over 15,000 feet above sea level. In India there are 320 species of land and sea snakes, of which about 70 are poisonous. Contrary to popular belief, the size, colour, and appearance of a snake has no relation to its venomous qualities ; in fact some very small ones, such as *foorsa* (*Echis carinata*) are deadly, while some of the larger ones, such as *dhaman*, python, etc., are non-poisonous. In India, every year between twenty and thirty thousand deaths take place from snake-bite, mostly among villagers and field workers who go bare-footed, Assam, Bengal, Bihar and Orissa contributing the most. The total number of persons killed annually from snake-bite in the world is estimated to be over one hundred thousand.

Snakes are nocturnal in habit, but like to bask in the sun during the cold weather. They live underground in burrows and come out at night in search of food, which consists of rats, mice, frogs, lizards, and other vermin ; they enter human habitation in search of these. Some of them can climb trees and are often seen in the green foliage. They are timid and do not attack but slink away when disturbed, and when brought to bay or accidentally trodden on they attack viciously. The king cobra is the only snake that is known to attack unprovoked. Some snakes produce an unpleasant hissing noise by forcibly expelling air from the lungs through the nostrils which has given rise to the belief that the snake spits poison at its enemy so as to blind him, but there is no truth in this. Snakes are either oviparous, *i.e.*, lay eggs from which young ones are hatched, or are viviparous *i.e.*, give birth to fully developed young ones ; all vipers belong to the latter class. The young ones of poisonous snakes are poisonous from birth, and many unpleasant accidents have happened by ignorant persons handling them. The life of a snake is from ten to twenty years and a female produces from 20 to 100 young ones every year. Snakes do not possess ears but they can hear sounds conveyed to the brain through the bones.

There is no doubt that many deaths occur from the bite of harmless snakes through sheer fright, as there is so much superstitious dread about snakes. It is therefore very important to be able to make out whether a snake is poisonous or not. The identification of different varieties of poisonous and harmless snakes is a vast subject and requires special study, but with a little knowledge it is easy to distinguish a poisonous from a non-poisonous one. All snakes with compressed or flat tail are sea snakes and are poisonous. All poisonous land snakes of India belong to three groups, *viz.*, vipers, cobras, and kraits. Coral snakes, which may be grouped with cobras, are poisonous but their poison is not deadly to human beings. Any snake that cannot be placed in one of these three groups is non-poisonous.

(I) *VIPERS.* These are divided into two classes, (a) pit vipers, and (b) pitless vipers, both of which are poisonous.

(a) *Pit viper* has the following features from which it can be easily identified. (1) The head is triangular, well formed, and covered either with small uniform scales of more or less the same size (fig. 34), or with large scales of different sizes which are called shields. (2) There is a small pit between the nostril and the eye on each side (fig. 35), and (3) broad ventral plates, *i.e.*, the transverse scales on the belly. These plates extend from side to side so that when the snake is placed on its back the body scales are not visible, or only a part of the last row is seen (fig. 36). The size and colour of the pit viper vary a good deal in different species.

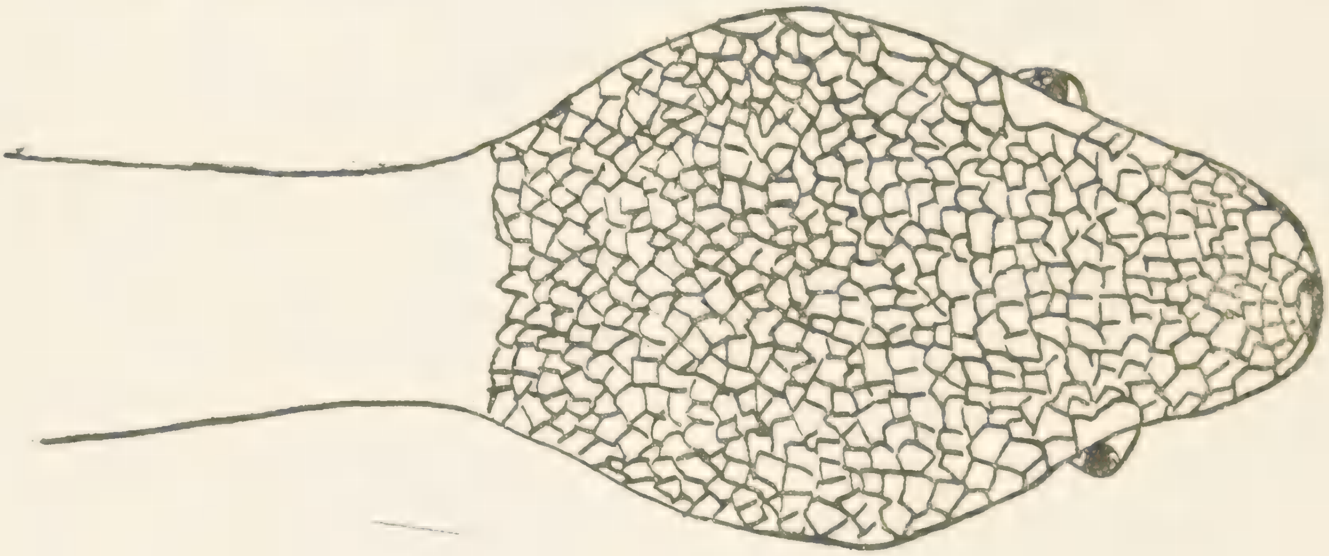

FIG. 34

Head of a viper covered with small scales.

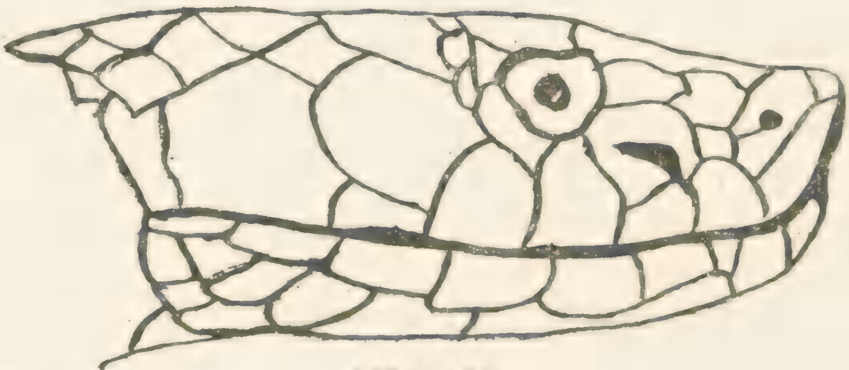

FIG. 35

Head of a pit viper covered with shields. Note the pit between the eye and nostril.

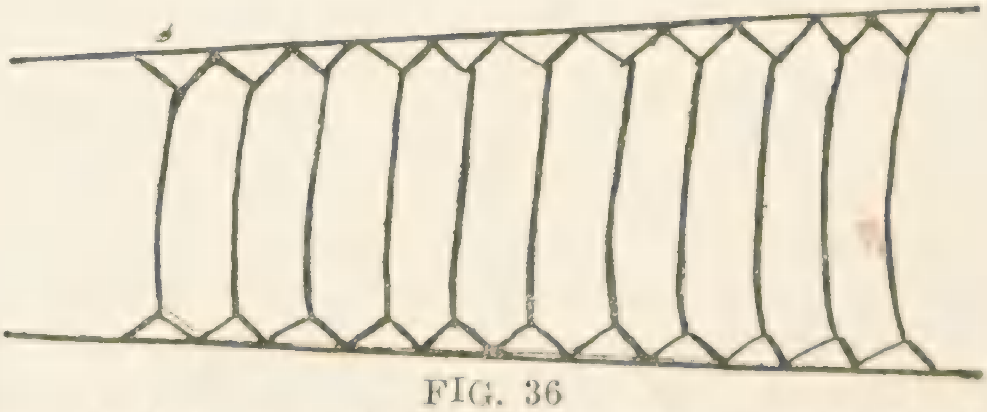

FIG. 36

Board ventral plates seen when the snake is turned on its back. These extend from side to side. Compare this with fig. 43 b.

(b) *Pitless Viper.* It has (1) small scales of more or less the same size on the head (fig. 34) and (2) broad ventral plates extending from side to side as in pit vipers. If these two features are present the snake is a pitless viper, as no other snake has them. The two most common pitless vipers found in India are Russel's viper and *foorsa*. These are easy to identify on account of distinctive markings on their bodies. The former has three rows of large, blackish brown or lighter coloured spots running the whole length of the body, one on each side and the third along the back, the ground colour of the body being lighter brown. The plates under the belly are wide and those under the tail divided. It is about four feet in length, stout and sluggish in movement, but when disturbed makes a loud hissing noise and strikes viciously. Its venom is very deadly to man and animals. It is found up to a height of ten thousand feet above the sea level. The other pitless viper found in India is *foorsa*, which is known under different names in different parts of India. The scales on the head and the plates on the belly are the same as in the Russel's viper. It is a small snake rarely measuring more than 20 inches, but has long fangs. Its colour varies from light brown to sandy or greenish according to the surroundings. It has a triangular or arrow-like mark on the crown of the head and wavy lines on each side of the body. There are other pitless vipers but they are much less common than these two.

(II) *Cobra.* A live cobra with its hood opened is not difficult to identify ; it becomes erect with extended hood when about to strike. Its length varies between four and five feet, the king cobra being twice that length. The hood is produced by the extension of ribs below the head,

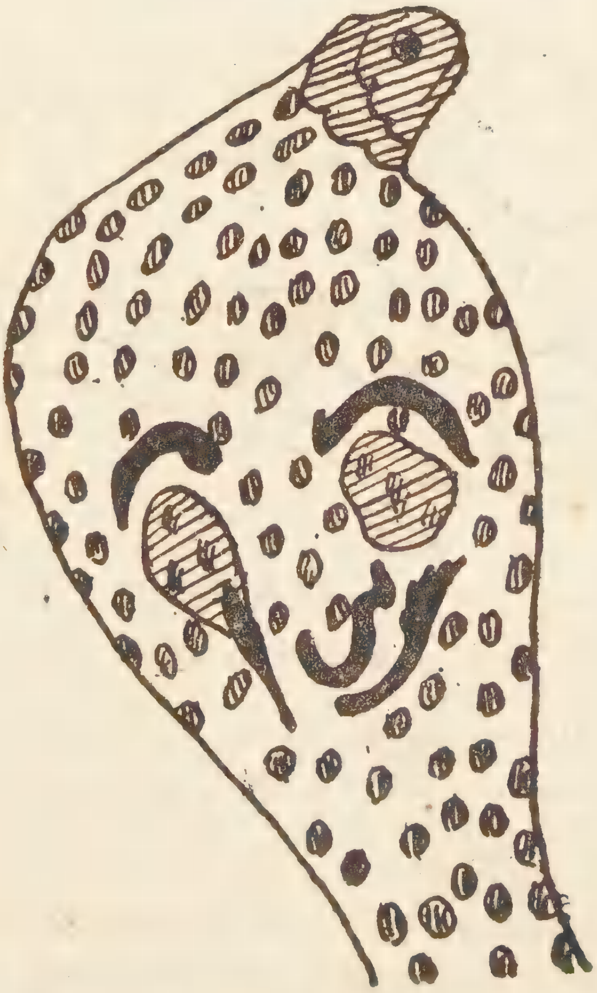

FIG. 37
Head of a cobra with hood open.

which is not noticeable when the snake is dead or resting. It has a peculiar spectacle-like marking on the head (fig. 37) which is sometimes very faint or absent. It has the following features from which it can be easily identified. (1) Broad ventral or belly plates (fig. 36), (2) the head covered with shields, of which third supra-labial, not counting the central, is large and touches the eye and the nasal shield (fig. 38), (3) between the fourth and the fifth scale on the margin of the lower jaw there is a small cuneate or wedge-shaped scale, and (4) all the scales on the back are of the same size, there being no enlarged row in the middle.

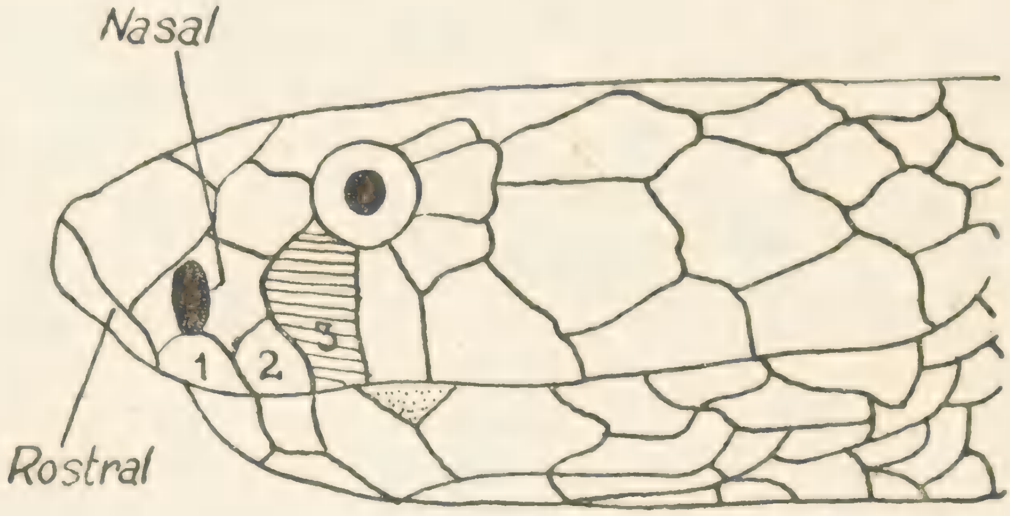

FIG. 38

Head of a cobra showing the shields. The third Supralabial is the largest touching the eye and the nasal shield. Note the small cuneate shield on the lower jaw.

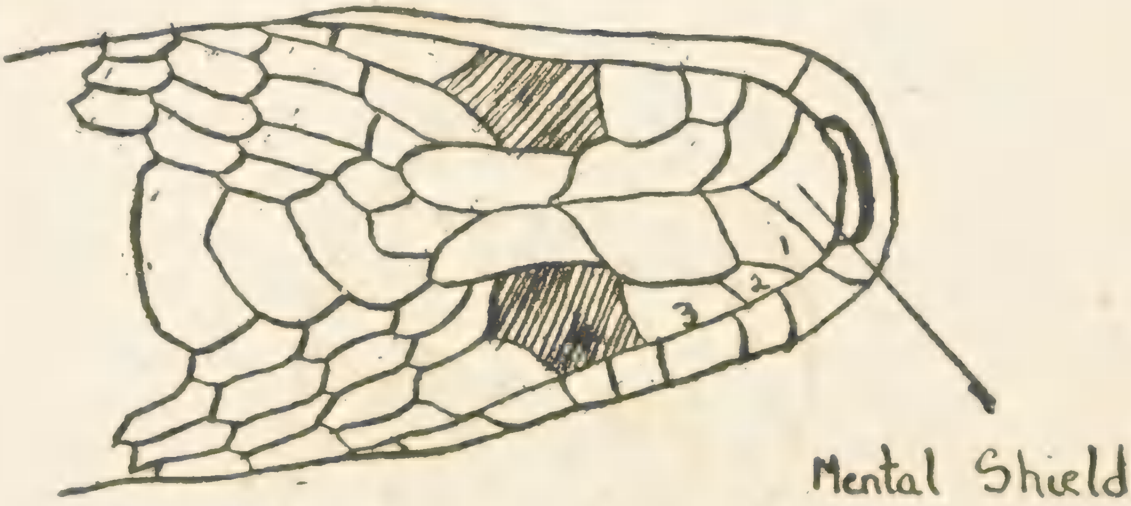

FIG. 39

The lower jaw of the krait as seen from below. The fourth shield is the largest.

(III) *Krait*. There are many varieties of krait of different colours with coloured bands across the body. It has the following characteristic features: (1) broad ventral plates (fig. 36), (2) the head covered with shields without a pit, and the lower jaw has four shields on each side of the central which is known as the mental, the fourth being the largest (fig. 39), (3) a row of distinctly enlarged scales running along the middle of the back (fig. 40), and bodies of various colours with white, yellow or blue bands, but this last feature is not confined to kraits.

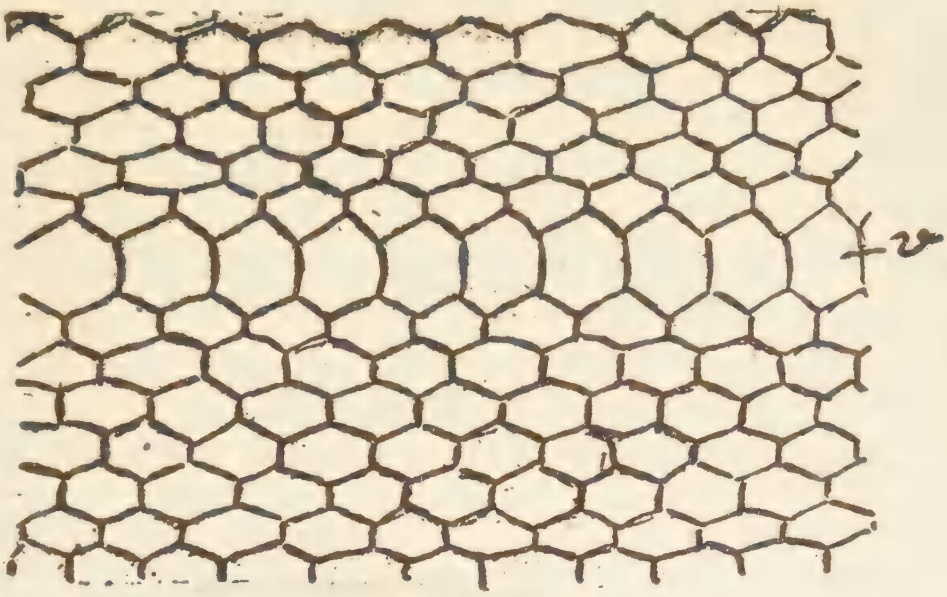

FIG. 40

The middle row of enlarged scales *v* on the back of a krait. Slightly enlarged vertebral scales are found in some non-poisonous snakes, but in them the feature mentiond in fig. 39 is absent.

How to Distinguish a Poisonous from a Non-poisonous Snake. Turn the snake on its back and examine the ventral or the under surface ; if there are small scales on it similar to those on the body (fig. 43a), or the plates, i.e., the transverse scales are not wide enough to cover the whole breadth of the belly and show one or more rows of the body scales (fig. 43b) the snake is non-poisonous and requires no further examination. But if the ventral plates are broad enough to cover the whole width of the belly as in fig. 36, the snake may be poisonous or non-poisonous.

It is poisonous if (1) the head is well formed, more or less square in shape, and covered with small scales of uniform size with or without a pit between the eye and the nostril, (fig. 34) the snake being a pit or pitless viper, (2) the head is covered with shields of different sizes with a pit between the eye and the nostril, the snake being a pit viper (fig. 35), (3) the head is covered with shields of different sizes, the third supra-labial situated on the margin of the upper jaw—not counting the rostral in the centre—is large and touches the eye and the nasal sheild, as in fig. 38, the snake being a cobra, in which case there is an additional feature, viz. a small cuneate or wedge-shaped shield on the margin of the lower jaw between the fourth and the fifth shield ; or (4) the head is covered with large shields without a pit, and there are only four shields on the margin of the lower jaw on each side, the fourth being the largest, as in figure 39. The snake, in this case, is a krait which has a distinctly enlarged row of scales running the whole length of the middle of the back (fig. 40) These two features with coloured bands across the body are characteristic of krait, (5) the tail is flat or compressed, it is a sea snake and therefore poisonous, (6) fangs are present. A non-poisonous snake has two rows of fine sharp teeth on each side of the upper jaw, the fangs being absent. These curved sharp teeth are meant for holding the prey securely and not for masticating, as the snake does not masticate but swallows it whole. They are curved backwards so that once the prey is caught by them it is impossible for it to escape. In the poisonous variety the outer row of these teeth is shorter or absent and their place is taken by the fangs.

These are long, hollow like a hypodermic needle through which the venom is injected into the wound from the poison-secreting gland that is situated in the palate. They are not visible when the mouth is opened as they are folded back and covered with a fold of mucous membrane (fig. 41). To demonstrate them run a long needle along the upper jaw from behind forward so as to lift them. The finger should not be used for the purpose as the prick is dangerous. In a badly crushed head all the features are destroyed and cannot be demonstrated. In order to kill a snake it is enough to break the spine near the head with the flick of a strong cane. Figure 42 shows the fangs extended and ready to strike.

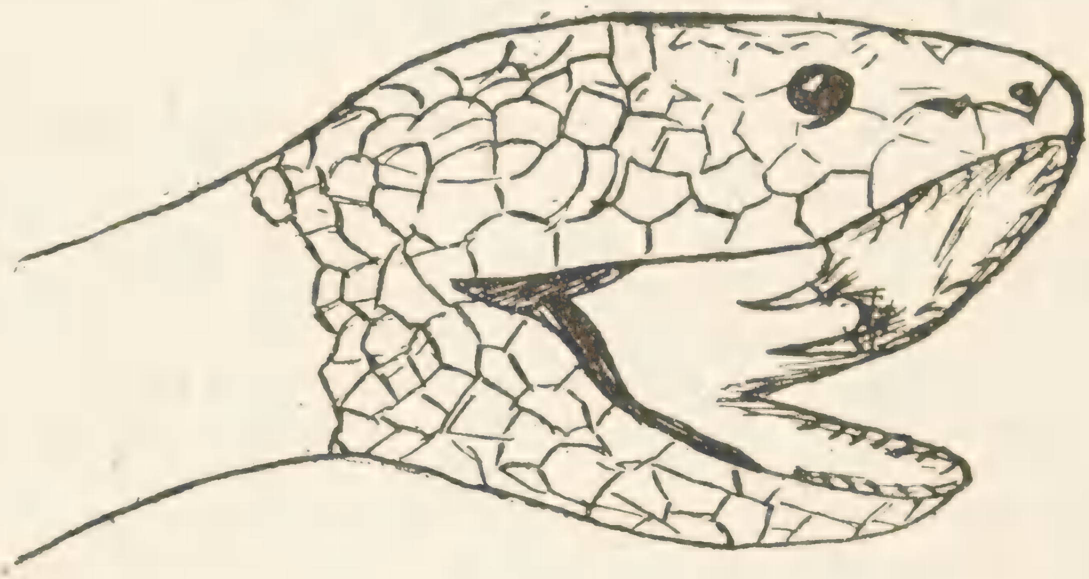

FIG. 41

Mouth of a poisonous snake showing the fangs folded back, the mucous membrane is partly retracted to expose the fangs.

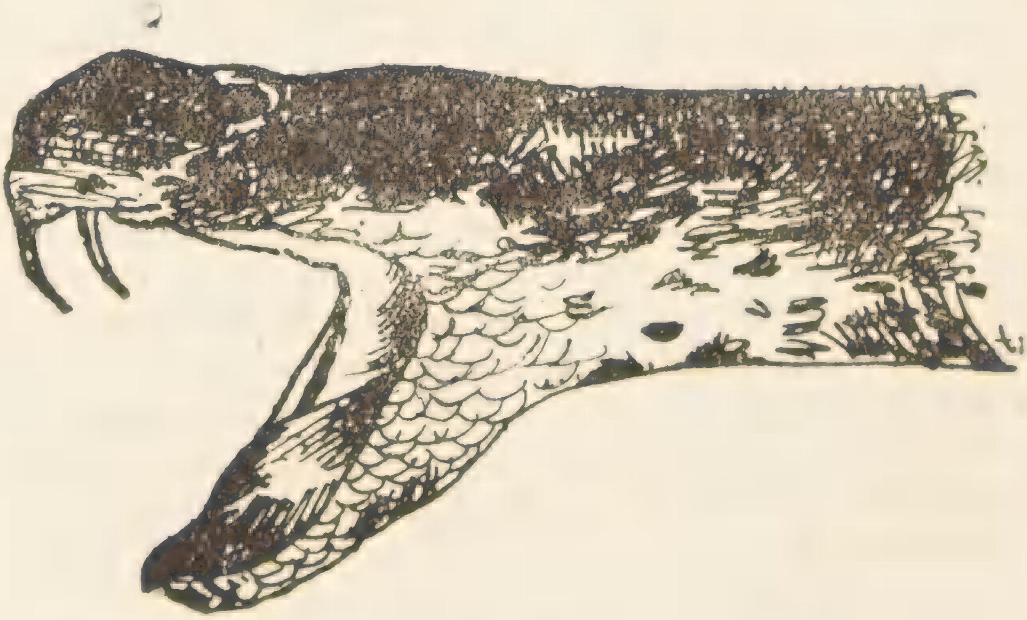

FIG. 42

The fangs extended ready to strike.

The following table will be found useful for ready reference.

Belly

Covered with small scales of uniform size or with narrow plates.

Non-poisonous.

Covered with broad plates.

Poisonous if,		Non-poisonous if,
1. Head covered with small uniform scales and pit absent...........	*Pitless viper*	1. Head not covered with small uniform scales.
2. Head covered with small uniform scales or large shields with a pit.	*Pit viper*	2. Pit absent.
3. Head with large scales and pit absent. The third supralabial large and touching the eye and the nasal shield. A small cuneate shield between the fourth and the fifth infra-labial shield.........................	*Cobra*	3. Third supra-labial not touching the eye and the nasal shield.
4. Head with large scales, pit absent and only four scales on the margin of the lower jaw, the fourth being the largest. The scales running along the middle of the back distinctly larger than the rest..................	*Krait*	4. Fourth infra-labial not being the largest, or more than four infra-labials present.
5. Fangs present in all the above		5. Fangs are absent.

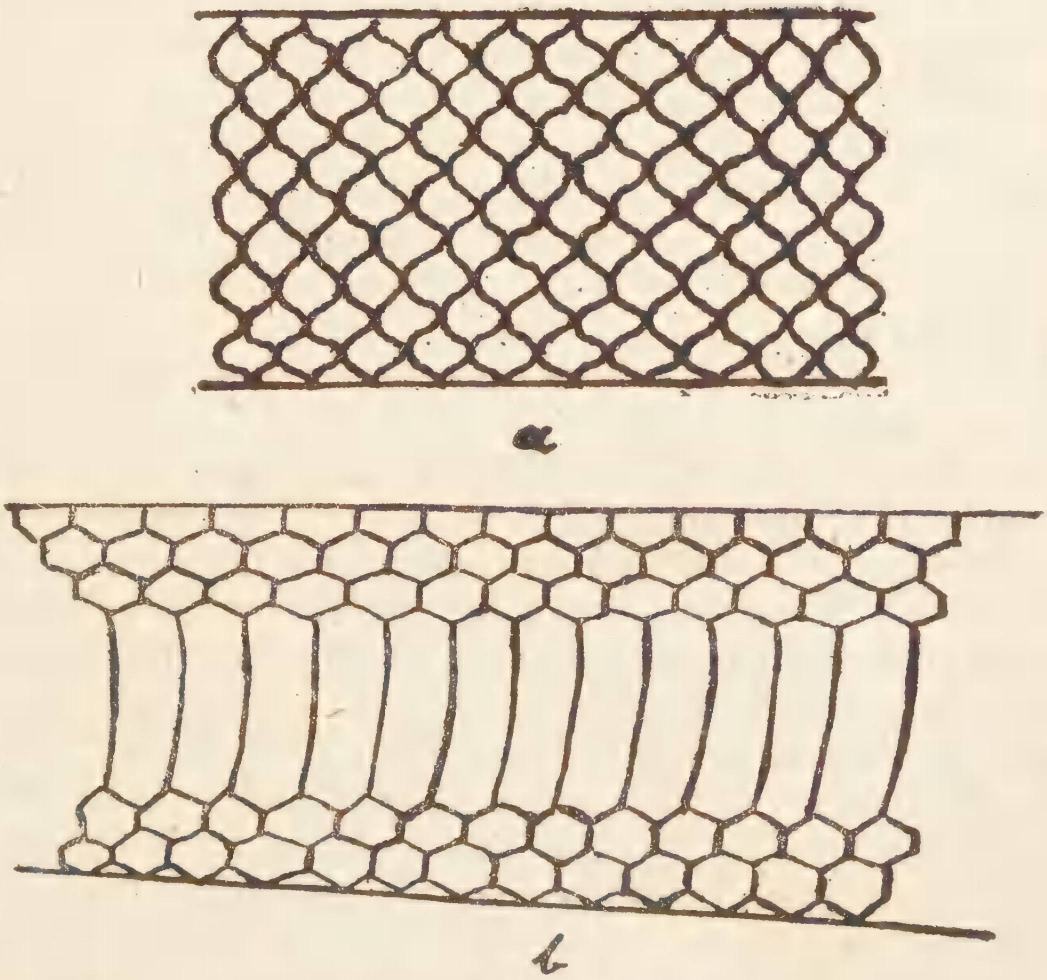

FIG. 43

Ventral or belly surface of a non-poisonous snake. *a*, covered with small uniform scales, and *b*, covered with narrow plates which do not extend from side to side but show more than one complete row of small scales on each side.

Snake-bite. Although the bite of all venomous snakes is dangerous, it is not always fatal ; this is so in case of coral snakes whose venom is not deadly to man. Even a deadly snake may fail, under certain circumstances, to inflict a fatal bite. This may happen if the part is bitten through thick clothing which prevents the fang from producing a sufficiently deep puncture, or if the snake has previously bitten several persons or animals thereby reducing the stock of venom in the gland for the time being. The lethal dose for a strong healthy adult is one minim, while a cobra injects four times that quantity in one bite. The severity and rapidity with which the symptoms develop depend upon the amount of poison injected, the age and general health of the person bitten. A full grown Alsation dog died from a cobra bite in five minutes and a buffalo in an hour and a half. The death is rapid if by any chance the venom is injected into a vein.

The venom is of the nature of protein and like other proteins it may be swallowed with impunity and digested by the stomach without producing any unpleasant symptoms, provided there is no breach of surface in the alimentary tract through which it can enter the circulation. The venom of different snakes acts differently on the body. The cobra and krait venom is neurotoxic, i.e., a nerve poison which acts on the nervous system and kills by paralysing the heart and respiratory muscles, while the viper venom is haemolytic, i.e., destroying the blood ; it damages the vessel walls also so that bleeding takes place, not only from the wound, but in all parts and organs of the body. It contains some neurotaxic element also, but the haemolytic element is more predominant.

The bite of a venomous snake usually leaves two minute punctures with a short distance between them which varies according to the width of the snake's jaw. These are from $\frac{1}{4}$ to $\frac{1}{2}$ inch deep and penetrate in a curved direction on account of the curvature of the fang (fig. 42). In some cases only one puncture is produced, which is due to the bite being inflicted sideways so that the bitten part is caught by one side of the jaw. In order to demonstrate the punctures it may be necessary to wash the part with soap and water and use a magnifying glass. Sometimes there is a deep scratch or a cut caused by forcibly withdrawing the part when the bite is being inflicted. If there are several tiny punctures or superficial scratches, they are very probably caused by a non-poisonous snake, especially if no local symptoms, such as pain, swelling, burning, numbness, or bleeding develop. It is therefore possible in many cases to determine whether the snake is poisonous or not by examining the part bitten.

At the site of the puncture there may be no symptoms for some time but usually there are some burning pain, and swelling which increase in intensity, and in case of cobra or krait bite, are followed by numbness which gradually extends up the limb and the trunk. If the bite is by a viper, there is some oozing of thin watery blood from the wound. In the former sometimes the symptoms develop within a few minutes and death may take place within an hour or it may be delayed for more than twenty-four hours ; but if the victim escapes death, he soon regains his full health without any ill effects remaining behind. Fright produces severe shock that alone may kill the patient. Viper venom takes longer to act, the symtpoms are developed after some hours, and death takes place after a week or so. If the patient survives he never regains his usual health.

First Aid and Treatment. In a very large proportion of cases the lower limbs are bitten, the upper extremities being less frequently involved, while bites on the face and body, though not unknown, are fortunately rare. The venom is injected with sufficient force by the contraction of the muscles attached to the poison gland so that it spreads in the tissues under the skin, from where it is taken up into the general circulation within ten minutes. So the treatment, to be of any use, should be very prompt. It consists in preventing or delaying the absorption of the poison into the system, destroying it at the site of injection, and, lastly, neutralizing it in the body before it has time to do serious damage. The first thing to do is to apply at once a sufficiently tight ligature to the limb on the side of the heart so as to prevent the circulation of the poison; this will give time to adopt other measures.

If the snake is killed and found to be harmless, and the finding confirmed by the nature of the wound as described above, the ligature should be removed and the wound cleaned and treated with some antiseptic lotion and covered, no further treatment being necessary. In case of doubt, or if the snake is found to be poisonous the ligature should not be removed. The site of the bite should be washed and cleaned with some lotion, and with a lancet or penknife, which is cleaned, an incision about an inch in length and deep enough to expose the whole length of the puncture and a little beyond, is made in the direction of the long axis of the limb, and the wound filled with a little powdered permanganate of potassium which is gently rubbed in it. The incision should always be placed in the direction of the long axis of the limb so as to avoid the risk of injuring blood vessels and nerves. Pure permanganate of potassium has a caustic effect on the tissues, but this is nothing compared to the serious risk run by the patient. It destroys the venom when it comes in direct contact with it. A small lancet, known as Lauder Brunton's snake-bite lancet, is a very handy instrument to carry in one's pocket, especially in snake infested areas. It consists of a sharp-pointed lancet protected by a screw cap and mounted in a hollow handle which contains crystals of permanganate of potassium.

Even when the above treatment is carried out thoroughly, a certain amount of venom is likely to escape destruction and requires to be neutralized by the injection of antivenene serum. This should be arranged for as soon as possible, or the patient removed to the nearest hospital immediately after the first aid is given. As for the ligature, any suitable material, which is not likely to cut the skin such as a handkerchief, bandage, or a piece of cloth may be utilized. It is not safe to allow the ligature to remain longer than twenty minutes or so, as otherwise the part below the ligature will become gangrenous. If medical help is not likely to be available within half an hour, the ligature should be loosened every twenty minutes for two minutes at a time to allow fresh blood to circulate in the limb. A small quantity of poison will be absorbed into the system during the two minutes, but it can be disposed of by the resisting powers of the body. In order to do this properly, the time when the ligature is applied should be noted. The antivenene serum is not likely to be of any use if a large quantity of venom has already entered the system and has had time to act on the tissues.

The serum is prepared by immunizing a horse against the venom. This is done by injecting a very small or sublethal dose of the venom into it, which does not produce any harmful effects. The blood of the animal so injected prepares a substance known as "anti-body" which is an antidote to the venom. The quantity of this antidote in the body can be increased considerably by gradually increasing the dose of the venom injected until the lethal dose is exceeded without harming the animal. The serum of the immunized horse is collected and kept in sealed glass tubes. It is known as multivalent or polyvalent serum as it contains the antidote for cobra and viper venoms. Antivenene for the krait and *foorsa* venom is not available as these snakes do not thrive in captivity and sufficient venom from them cannot be collected for immunizing purposes. However attempts are being made to prepare antivenene for these snakes also.

Precautions against Snake-Bite. Snakes are nocturnal in their habits and during the day remain hidden in their holes or in stacks of wood, stones, etc. A snake when disturbed slinks away quietly and rarely attacks unless it is trodden on or is startled at close quarters. The hamadryad or king cobra and sometimes the cobra attack without provocation. On account of its defective hearing, a snake remains lying in one's path and is liable to be trodden on. Villagers have cultivated the habit of always keeping their eyes on the ground when walking in jungles. The postal runners, who have to travel cross country at night, carry a long bamboo stick to one end of which are attached small bells which keep jingling when they run. Cattle and buffaloes, when grazing in jungles, have brass bells attached to their necks to frighten away snakes. A long bamboo stick, split at one end for about eight inches, is a very good weapon to carry about while walking in the jungle after dark. When beaten on the ground it makes enough noise to frighten away snakes in the vicinity. It is advisable to carry a light at night and look on the ground in front. While camping, a light should be kept near the bed. Boots and shoes should not be kept on the ground, or should be stuffed with old newspapers to prevent any vermin getting into them.

Persons frequenting jungles for business or pleasure should carry with them all the essentials required for the first aid and treatment of snake bite. The medicine chest should contain a couple of Lauder Brunton's lancets, a small quantity of permanganate of potassium; a couple of rolls of broad bandage, which can be used as tourniquet, and three tubes of fresh polyvalent antivenene serum of 20 c.c. each. The last is very necessary as the medical man called to treat the case, or the village dispensary may not have it or the stock may be old and deteriorated. It can be obtained on payment from the Central Research Institute, Kasauli. It is to be used before the date of expiry printed on the label or discarded after that.

Alleged Cures for Snake-Bite. Very often stories of wonderful snake-bite remedies, "snake stones", and magic cures are circulated and many enthusiastic persons testify to the efficacy of some particular remedy. Many roots, herbs, decoctions, and mysterious stones have been advocated from time to time, all of which have been scientifically tested and found to be quite useless. In many cases the cure can be accounted for in other ways ; the bite might have been from a harmless snake, or in case of a venomous snake the fang did not penetrate deep enough, or the stock of venom had been exhausted when the bite was inflicted. It is not only useless but positively dangerous to waste any time over such cures, as, so far the only reliable remedy is antivenene serum injected early and before the venom has time to cause irreparable damage to the body.

A tragic instance of belief in such magic cures occurred some years ago in a large city in India. A snake charmer appeared in the bazar with a basket containing a full-grown cobra and produced a small round stone, which, he said, was guaranteed to draw out and absorb the venom if applied to the wound. In order to prove this he called for a volunteer from the audience to allow himself to be bitten by the cobra, but no one came forward for the experiment. He was so sure of the efficacy of his remedy that he got himself bitten and applied the "stone" to the bite, but unfortunately for him it did not work and he got severe symptoms of poisoning and had to be removed to hospital where he died within two hours of admission.

Some household remedies, such as chillies, brandy, ammonia, etc., have been advocated and used in the absence of the antivenene serum, but they are only stimulants and have no curative effect.

Chapter 11

AYURVEDIC AND UNANI SYSTEMS OF MEDICINE

A good deal of ignorance prevails among the public as to the difference between the indigenous and Western systems of medicine which is called allopathy. In spite of a good deal of apparent difference between them they are practically the same, the one being a very old edition and in a very primitive state, as it was practised centuries ago and based merely on empiricism, while the other originally acquired from the East has been developed in the West with the help of many collateral sciences, such as chemistry, physics, biology, anatomy, physiology, bacteriology, etc. In order to understand this better it is necessary to recapitulate the history of their origin and development.

In India the art of healing was practised many centuries ago and Emperor Asoka in the third century B.C. had established hospitals for the treatment of the sick in many parts of his empire and encouraged the study of pharmacology. Some few ancient physicians have left the records of their observation and research which are still available. In those days Europe was in a state of utter darkness and the art of healing as such was not known there. Even in the middle ages it was mostly in the hands of priests and charlatans, who used to treat diseases with charms, magic, holy relics and prayers. The diseases were supposed to be due to possession by the devil, who seemed to be very active in those days, and the treatment was directed towards exorcizing the evil one and often the patient was beaten mercilessly by way of treatment so as to drive him away. Till a comparatively late date witches were supposed to cause illness and epidemics and many an innocent woman was burnt alive.

From ancient papyri and the examination of mummies it is certain that the art of healing on scientific lines was practised in Egypt sixty centuries ago. The science of hygiene had reached a high state of development amongst the Aryans four thousand years before Christ as can be seen from the excavations of Mahanjo Daro and the religious literature of the Hindus and Zoroastrians. Surgery was practised in ancient India on scientific lines and some of the instruments used by ancient Indian surgeons resemble those used in the twentieth century in Western surgrey. The knowledge of anatomy was acquired by dissecting bodies of animals. Unfortunately, with all that, the progress of the science of medicine did not continue. There were periods of standstill and retrogression on account of the want of organized effort on a collective basis as is done in the West. Research was carried out individually and everyone kept the result of his research secret which died out with him.

The Arabs conquered Spain in the early part of the eighth century and carried with them all the sciences they had acquired from the conquered nations of the East to Europe. The hitherto ignorant and superstitious West avidly took up the study of different sciences and scientific methods and made a rapid progress in them, while the lethargic East, where all these had originated, not only remained in the same primitive state, but lost most of what it possessed. The invention of the microscope and numerous other appliances, chemistry, physics, biology, and other sciences opened up a new vista of approach to the study of the origin of diseases and contributed greatly towards the advancement of the art of healing in the West. The old idea of the humoural origin of diseases has become quite obsolete and has been given up, yet in the indigenous systems the same primitive and mistaken ideas of humoural pathology still hold the field and diseases are supposed to be caused by the disturbance of the body humours, thus the very foundation of medical science is based on a wrong supposition. Bacteriology, a comparatively recent science, has solved the mystery of the origin and behaviour of many diseases which were supposed to be due to humoural disturbances, but which are now proved to be due to micro-organisms that are responsible for about sixty per cent of all the diseases ; the rest are caused by faulty diet, new growths, injury, or poisons.

Allopathy is not really a different system of medicine, but an advanced and scientifically developed edition of the old one, which, in its primitive and undeveloped state, is known as Ayurvedic or Unani and which is practised by indigenous practitioners. If it were to shed its thousand-year old obsolete ideas and take advantage of all the latest scientific methods of investigation and diagnosis of diseases with the latest appliances, and make use of, for the treatment of diseases, the latest and most wonderful specific drugs, such as salvarsan, bismuth, sulpha-drugs, insulin, penicillin, numerous synthetic drugs, and all the protective and curative vaccines and sera, it would be nothing but modern allopathy. It stands to reason that in the relief of suffering the most efficacious drugs and the best methods of investigation and diagnosis should be employed, and it would be sheer folly to discard them because they are of foreign origin and do not belong to the indigenous system.

Many drugs and preparations used in the indigenous system are crude, bulky, unpurified, and vary in composition and strength and in their action on the body. Many of these are incorporated in the Western medicine after they are purified, their strength and doses standardised and their action on the human body studied scientifically. Of late, an attempt is being made to place Indian pharmacology on scientific lines, which means commencing from where it was left some thousand years ago and modernizing it, although we already have the most up-to-date edition of it. Some of the crude drugs used in the indigenous system are said to be very efficacious for certain diseases, but if found really useful on investigation, there is nothing to prevent them being incorporated in allopathic medicine.

It is argued that the indigenous system is not expensive and is, therefore, suitable for medical relief in rural areas for the benefit of villagers. But for medical relief efficiency and not cheapness should be the criterion. There is no reason why villagers should be provided with cheap and inferior kind of medical relief while the more efficient should be reserved for urban areas.

CHAPTER 12

QUACKS AND QUACKERY IN INDIA

India is one of the countries where quackery flourishes to an incredible extent, though it is not quite absent in more enlightened Western countries, where in spite of stringent laws against unqualified medical practice, many quacks manage, somehow or other, to thrive. India is the heaven for this class of practitioners, as there are practically no laws to prevent them from carrying on their nefarious trade, which they do openly. The people of India, including the educated classes, are particularly ill-informed and ignorant about medical and hygienic matters, and of late, the tendency has been rather to encourage this class of practitioners because they are very noisy in their claims.

The science and practice of medicine does not merely consist of the knowledge of the virtues of some drugs and herbs, but is based on many collateral sciences, such as chemistry, physics, biology, human anatomy, physiology, pathology, etc., and the most important part is the art of diagnosis, without which it is impossible to treat a patient on rational or scientific lines. To acquire a workable knowledge of these requires seven years of hard work and clinical experience in a large hospital, and even after passing a stiff test at the end of these studies the qualified medical man is just initiated into the art of healing and has still much to learn. It is, therefore, not at all difficult to understand that all the quacks who practise under different attractive designations are dangerously ignorant and have no right to make all the impudent and preposterous claims which are so blatantly made by them.

These quacks thrive on the ignorance of the public on account of certain traits or weaknesses of human character, viz., suggestibility, credulity, and the love of the secret and mysterious. Very few sufferers can resist the temptation to try some useless or even harmful remedy if its virtues are constantly extolled in bold advertisements, some of which are so cleverly worded that even a healthy but suggestible person is led to believe that he is or will soon be suffering from some dreadful disease which the doctors cannot cure. It is very often given out that the particular remedy has been secretly communicated to the vendor by a *mahatma* or a *sadhu* and obtained with difficulty from the Himalayas or Tibet or some other inaccessible place. Strange to say, there are many persons who swallow such unadulterated nonsense at a single gulp. It does not require much common sense to realize that if a great soul wished to give out the secret of a marvelous cure for an incurable disease, he would not be so silly as to entrust the secret to some selfish and ignorant person not acquainted with the art of healing, who would use it for his own selfish ends. If a *mahatma* really wished to be of any use to humanity, he would disclose the remedy to a man of science who would use it not for his own gain but for the benefit of mankind. Every medical man practicing in India often hears about some wonderful cure brought about by some such pretender, but on careful investigation every case is found to be either a gross exaggeration or pure fiction.

Apart from these advertising quacks there are many other unqualified and ignorant practitioners who call themselves homoeopaths, naturopaths, osteopaths, paralysis specialists, bone-setters, etc., but who are really "humbugopaths," and who practise medicine without having attended any college and without possessing any knowledge as to what the diseases really are, how they originate in the body or the manner in which they progress. All these are really dangerous to public health.

Homoeopathy was founded in 1810 by a qualified German doctor, Samuel Christian Fredrich Hahnemann, who had a sound knowledge of the fundamental sciences on which the art of healing is based. One of the theories propounded by him is that diseases can be cured by the administration of minute doses of a drug which produces symptoms similar to those produced by the disease. There is no doubt that some few diseases respond to such treatment, but it cannot possibly be applicable in every case. Besides, to diagnose a disease from the symptoms and from physical and other examinations requires a thorough knowledge of the fundamental sciences, which such homoeopathic practitioners, who take up the practice of medicine after reading a book which describes some symptoms and the drugs to be administered for their cure, do not possess. Many of them blatantly claim to be able to cure cancer, while they do not know what cancer is, how it spreads in the body and how it kills. So far no cure for cancer is known although millions are being spent in different countries of the world on scientific investigation and hundreds of first rank scientists are engaged in conquering this terrible disease. Could it be possible for an ignorant practitioner to cure it ?

The only way to get the best out of homoeopathy would be, in the first place, to put a stop, by law, to all such irregular practice by ignorant quacks and all the bogus institutions which confer high-sounding degrees and diplomas on any one who is able to send a remittance to them ; and secondly to encourage further scientific investigation by those who are capable of doing so on account of their scientific training. In India such men and suitable institutions are available. A post-graduate course in homoeopathy might be instituted with advantage in some of the existing medical colleges, without much expenditure of money, which is so badly needed for extending medical relief to rural areas, instead of spending a large sum on a special homoeopathic hospital. It would be of interest to know that such special hospitals were, at one time, opened by homoeopathic enthusiasts in Leipzig, Munich, and other places but ultimately all of them had to be closed down or converted into dispensaries, and even in Germany, its birth place, it has made no headway.

Very absurd claims are made by some unqualified practitioners who make use of certain therepeutic measures commonly used by qualified medical practitioners in certain suitable cases, such as fasting, purgation, enema, baths, electricity, diet, and regular exercise, and who, without the least knowledge of the pathological conditions present, or how these measures are beneficial in certain conditions, claim that their method of treatment alone can eradicate the roots of the disease, while the treatment given by qualified allopathic practitioners removes the symptoms only leaving the roots behind. It sounds so very plausible that many intelligent persons believe in such obvious nonsense. Any one, who has the least rudimentary knowledge of pathology, the origin of diseases and the changes produced by them in the body, can easily understand the hollowness of such a claim made by persons who have not seen a single post mortem examination nor attended a medical college for a single day. It is a well-known fact that nature has made ample provision in the body to get rid of any disease or abnormal condition, and the medical man with his knowledge of the origin and progress of the pathological condition helps nature in her work by administering medicines and applying certain suitable therapeutic measures.

When qualified medical men express disapproval of such irregular practice, ignorant persons, who have no idea of the science and art of healing, declare that doctors do so through jealousy. As a matter of fact science has no reason to be jealous of anyone or anything and there is no mystery or secrecy about it. No discovery made by science, except the production of the atom bomb, is kept secret for the benefit of the discoverer, but is immediately broadcast to the world for the benefit of humanity. The discoverers of chloroform, salvarsan, insulin, penicillin, sulphadrugs, and numerous other specific remedies did not make a secret of their wonderful discoveries but gave out the result of their life-long research for the good of mankind. These are real *mahatmas* or great souls.

The only way to abolish or mitigate the dangerous evil of all kinds of quackery in India, which seems to be on the increase, is to enlighten the public through the press, platform and radio about medical and hygienic matters. But the question is whether such a thing is possible in the present state of the country where masses of people are illiterate and grossly ignorant and most of our legislators themselves so little informed on medical matters. In all Western countries and in America no unqualified man is allowed to style himself doctor and no patent or secret remedy is allowed to be advertised or sold unless its contents are disclosed on the label and are verified by the public analyst, his fees and all the expenses of analysis being paid by the manufacturers.

Chapter 13

DISPENSING AND PRESCRIPTIONS

The British Medical Council is authorised by law to publish a list of drugs and chemicals used in medicine, their composition, doses, method of preparation, and the standard of purity required for medicinal purposes, and this publication is known as the British Pharmacopoeia. The drugs included in the book are known as the official drugs, while those not included in it, but used occasionally, are called non-official. Such lists are published in all civilized countries by legally authorised bodies. This ensures a uniform standard for the drugs used in the country. In India the British Pharmacopoeia is in vogue. There is no such list published for Ayurvedic or Unani systems of medicine and their drugs vary in composition, strength and dosage.

Those remedies put on the market by chemical or pharmaceutical firms under short trade names whose composition is given on the package, are known as proprietory medicines, which are frequently prescribed by medical men. All those medicines advertised in the lay press by quacks or unqualified persons as specifics for certain diseases, the composition of which is a secret, are known as secret or patent medicines; most of these, if not harmful, are quite useless.

The weights and measures given in the British Pharmacopoeia are according to the Imperial as well as the Metric or Decimal System, also known as the French system; the former is more in use in Britain and the Colonies while the latter is in general use on the Continent of Europe.

Measures of Mass. Imperial System

1 grain	written	Gr.	1
20 grains=one scruple	,,	℈	1
60 grains=one drachm	,,	ʒ	1
437.5 grains=one ounce	,,	℥	1

Measures of Capacity. Imperial System

1 minim	written	M.	1
60 minims=one fluid drachm	,,	ʒ	1
8 fl. drachms=one fluid ounce	,,	℥	1
20 fl. ounces=one pint	,,	O	1
8 pints=one gallon	,,	C	1

Measures of Mass. Metric System

1 milligrame (Mg) is a thousandth part of a gramme written	0.001	G
1 centigrame (Cg) is a hundredth part of a gramme written	0.01	G
1 decigrame (Dg) is a tenth of a gramme written	0.1	G
1 gramme (G) is the unit of weight written	1.0	G
1 kilograme (Kg) also called "kilo" in short written	1000.0	G

A gramme is the weight of 1 millilitre of water at 4° C and is equal to 15.432 grains, and one kilogramme is equal to 2.2046 lbs.

Measures of Capacity. Metric System

1 millilitre (cubic centimetre) is a thousandth part of a litre written	1 mil or 1 c.c
1 centilitre is a hundredth part of a litre written	10 mil or 10 c.c.
1 decilitre is a tenth part of a litre written	100 mil or 100 c.c.
1 litre or 1000 mil or 1000 c.c. written	1 Lit or 1000 c.c.

One millilitre or 1 c.c. is equal to 16.96 minims, and a litre is 1.76 pints.

Domestic measures may be used for convenience, but they are not accurate and vary a good deal. When accuracy is necessary in dispensing drugs accurate measure glasses should be used. These domestic measures are :—

1 Teaspoonful is equal to one fluid drachm or 4 c.c.
1 Desertspoonful is equal to two fluid drachms or 8 c.c.
1 Tablespoonful is equal to half a fluid ounce or 15 c.c.
1 Wineglassful is equal to 1½ to 2 fluid ounces or 45 to 60 c.c.

A drop is not always equal to one minim, as it varies according to the viscosity of the fluid and may be anything from ½ to 2 minims. For measuring a small quantity of a liquid a minim measure should be used.

For the purpose of dispensing medicines the following equipment is required :

1 Pestle and mortar, preferably of glass, never of metal.
1 Glass rod.
1 Glass pipette.
1 Minim measure glass.
1 One ounce measure glass.
1 One eight ounce measure glass.
1 Apothecary's balance with weights.
1 Spatula.
1 Glass spoon.
1 Porcelain slab.
Some empty medicine bottles of sizes, preferably with screw caps.

In dispensing medicine very small quantities of drugs are handled. It is therefore necessary to be very careful in weighing and measuring them and using accurate weights and measures. To start with the prescription should be read carefully and the bottles containing the drugs to be dispensed taken out and arranged on the dispensing table on the left hand side, in the same order as in the prescription, and as soon as a drug is weighed the bottle should be placed on the right hand side so that the same drug may not be dispensed a second time by mistake. Beam scales with glass pans should be used, the weights being placed in the pan on the left and the drugs in the right one which is removable for cleaning. Semi-solid and sticky substances should be weighed on a piece of glazed paper, a similar piece of paper being placed in the opposite pan. Solid drugs, after being weighed, are triturated in the mortar with a little water and the liquid drugs added to this in the large measure glass. The total quantity is then made up with water. It is not possible to measure a very small quantity of liquids, such as two or three minims ; in such cases 5 or 10 minims are taken and diluted with a measured quantity of distilled water and a proportionate amount of this diluted liquid taken which would contain the prescribed amount. Very minute quantities of solid drugs can only be weighed accurately in a specially made chemical balance ; but it is not necessary to have such a balance, as ordinarily all potent drugs are available in minute tablets containing the required dose. Alkaloids used for injection in minute doses are available in sealed glass capsules ready for use.

All liniments and medicines for external use should be dispensed in coloured bottles and labelled "Poison" so as to prevent accidents.

DOSAGE: There are many formulae for calculating proportionate doses for children, but the two given here are simple and easy to remember. According to Dr. Young's formula the proportion of the adult dose to be prescribed for a child, is arrived at by dividing the child's age by the age plus 12 ; thus for a child six years old the dose will be $\frac{6}{6+12} = \frac{1}{3}$rd the adult dose. The other formula is to divide the age by 20 ; thus the dose for a child 10 years old would be ½ the adult dose. Weakly and debilitated children should receive a little less ; similarly debilitated persons should be given less than the full dose. In case of women the dose should be reduced by 5 to 10 per cent, or roughly it should be 9/10th of the full dose.

Children are very susceptible to certain drugs, particularly opium and other narcotics, which should be avoided or given in smaller doses than calculated by the above method ; they should not be repeated too often. The same remarks apply to patients suffering from kidney or heart disease. Some persons are very susceptible to certain drugs, such as quinine, aspirin, iodides, mercury, opium, etc., which produce very unpleasant symptoms even when taken in small doses. Drugs like quinine, mercury, opium, arsenic, etc., are not ordinarily prescribed during pregnancy or menstruation unless absolutely necessary. Persons below the average body weight or above sixty require proportionately smaller doses.

PRESCRIPTIONS

In the following prescriptions the dose given is for an average adult, unless otherwise mentioned.

Draughts

(1) *Aperient Draught.*

Sulphate of Magnesium	drachms	2 to 4
Water	ounces	8

To be taken in the morning half an hour before tea as a mild purgative.

(2) *Carminative Draught.*

Bicarbonate of Sodium	grains	20
Carbonate of Ammonium	grains	6
Compound Tincture of Cardamoms	minims	40
Tincture of Nux Vomica	minims	10
Spirit of Chloroform	minims	30
Peppermint Water to make up to	ounces	2

Useful in windiness of the stomach. To be repeated after 3 hours if necessary.

(3) *Castor Oil Draught.*

Castor Oil	drachms	6 to 8
Mucilage of Acacia	drachms	2
Syrup of Ginger	drachm	1
Peppermint Water	ounce	2

(Shake well to make a uniform emulsion.)

(4) *Chenopodium Oil Draught.*

Chenopodium Oil	minims	8
Syrup	drachms	2

The above draught to be taken early in the morning and repeated every hour until three such doses are taken. Two hours after the last dose a saline purgative should be taken. Useful in thread worms or hookworm disease (ankylostomiasis).

(5) *Emetic Draughts.*

1.	Common Salt	ounces	2
	Warm Water	ounces	6
2.	Sulphate of Zinc	grains	30
	Water	ounce	1
3.	Sulphate of Copper	grains	5
	Water	ounce	1

To be repeated every few minutes until vomiting is produced.

4.	Ipecacuanha Powder	grains	90
	Water	ounces	3

(6) *Male Fern Draught.*

Liquid Extract of Male Fern	minims	60
Mucilage of Acacia	drachm	1
Glycerin	drachms	2
Syrup of Ginger	drachm	1
Water to make up to	ounces	2

Useful in tape worm. A light diet is taken at night followed by a mild saline purgative and the above draught is taken in the morning after a cup of tea or coffee followed after an hour by a saline purgative. Castor Oil should be avoided.

(7) *Sleeping Draughts.*

1.	Bromide of Potassium	grains	15
	Tincture of Opium (Laudanum)	minims	10
	Tincture of Hyoscyamus	minims	30
	Spirit of Chloroform	minims	20
	Water to make up to	ounce	1

Useful in sleeplessness due to painful conditions. To be taken one hour before going to bed.

2.	Bromide of Potassium	grains	15
	Chloral Hydrate	grains	15
	Syrup of Orange	drachm	1
	Water to make up to	ounce	1

To be taken one hour before bedtime.

3. *Paraldehyde Draught.*

Paraldehyde	minims	40
Syrup of Orange	drachms	2
Water to make up to	ounce	1

Useful in sleeplessness from any cause and is the least harmful. It induces six to eight hours refreshing sleep, the only disadvantage being its disagreeable taste. *No more than one dose of one of the above should be taken.*

Enemas

An enema is a fluid preparation injected into the rectum either to wash out the bowel, in which case it is large in bulk, being not less than one pint in case of an adult, or to introduce nourishment or medication through the bowel in which case its bulk is small, not more than 4 or 5 ounces at a time.

(8) *Simple Enema.*

Soap	ounce	½
Warm Water	pint	1

Dissolve the soap in water and inject slowly into the rectum. The bowel may be evacuated after 10 to 20 minutes.

(9) *Turpentine Enema.*

Rectified Oil of Turpentine	drachms	4
Simple Enema	pint	1

Useful in distension of the bowels with constipation.

(10) *Starch Enema.*

Starch Powder	drachms	4
Warm Water	pint	½

For irritating conditions of the rectum and lower bowel.

(11) *Starch and Opium Enema.*

Tincture of Opium (Laudanum)	minims	15
Starch Enema	pint	½

Useful in painful dysentery and ulceration of the lower bowel.

(12) *Boric Enema.*

Boric Acid	grains	20
Warm Water	pint	1

(13) *Glycerin Enema.*

Glycerin	ounce	1 to 2

This may be injected pure or diluted with an equal quantity of water. For children smaller quantity may be used.

(14) *Olive Oil Enema.*

Olive Oil	ounce	1 to 2

For children ½ to 1 ounce may be used.

(15) *Saline Enema.*

Chloride of Sodium (common salt)	drachm	1
Warm Water	pint	1

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Four to six ounces of the above to be injected very slowly into the rectum and repeated after an interval. It is used for replacing the fluid lost from the body by frequent vomiting or purging or after severe bleeding.

(16) *Nutrient Enemas.*

When for some reason or other the patient is unable to take nourishment by the mouth or is unable to retain it in the stomach, nourishment is given per rectum. The quantity given at a time should not exceed 4 or 5 ounces for adults, otherwise it is likely to be evacuated. It should be at the body temperature and injected very slowly. Any predigested food, milk, glucose, beef tea, yolk of a raw egg, or extract of malt may be given diluted with water. It is advisable to wash out the bowel before the nourishment is given. Ordinary nutrient enema consists of 4 ounces of peptonised milk, half an ounce of glucose, one yolk of an egg and half an ounce of brandy. Half an ounce of glucose dissolved in five ounces of saline enema may be given alternating with the above with an interval of four hours between each. The saline enema is also administered by the continuous method when a large quantity of fluid is to be introduced into the circulation, as in persistent vomiting, diarrhoea, etc. The can, filled with the saline, is suspended at a height of two feet from the level of the bed and the flow through the nozzle is regulated by a screw clip so that there is a steady flow at the rate of 4 ounces per hour ; the nozzle is then introduced into the rectum as far as it will go after it is lubricated with oil. A rubber catheter of a suitable calibre might be used in place of the hard nozzle, which will reach a higher level in the rectum and is not so uncomfortable.

Eye Drops

(17) *Argyrol Drops.*

Argyrol	grains	90
Distilled Water	ounce	1

A mild non-irritating antiseptic useful in acute conjunctivitis. For children half the above strength might be used.

(18) *Protargol Drops.*

Protargol	grains	30
Distilled Water	ounce	1

Useful in acute suppurative conjunctivitis.

(19) *Boric Acid Drops.*

Boric Acid	grains	10
Water	ounce	1

A mild antiseptic useful for douching the eyes.

(20) *Boric and Zinc Sulphate Drops.*

Boric Acid	grains	10
Sulphate of Zinc	grains	2
Water	ounce	1

Useful in chronic conjunctivitis.

Fomentations.

A fomentation is a hot moist application to an inflamed and painful part. It helps to reduce the inflammation and relieve the pain. It is applied with a thick piece of flannel, any woollen cloth or an old blanket, the length and the width depending on the part to be fomented. There should be at least two such pieces so that one is kept in hot water while the other is being used. The cloth is folded and held at each end and lowered into the hot water, the ends held by the hand remaining just above the water. When it is well soaked and heated it is wrung out by twisting, so that as much water as possible is removed. With a little practice this can be done without burning the hands. A safer way is to drop the heated flannel into a towel two ends of which are tied to the foot of the bed and the other two held by the hand. The towel is twisted with the hot flannel in it until most of the water is squeezed out from it, it can then be picked up and applied to the affected part. To begin with the hot flannel should be applied for a second or so at a time until the skin gets quite warm ; it will then bear the heat without much discomfort. When the heat is bearable the flannel is kept on the part and covered up with a thick towel to keep the heat from radiating rapidly ; in the meantime the other piece of flannel is prepared as above. This is done for 15 to 20 minutes, the part is then rubbed dry and covered with flannel. Fomentations may be applied three or four times a day or oftener if necessary.

(21) *Boric Fomentation.*

Boric Acid	drachms	8
Water	pints	8

(22) *Poppy-head Fomentation.*

Poppy-head (crushed)	ounces	4
Water	pints	8

Boil the crushed poppyheads well and strain before use. Useful for relieving pain and reducing inflammation.

(23) *Turpentine Fomentation.*

Sprinkle a little oil of turpentine on the hot flannel before applying it to the part. Useful in inflammatory conditions in the chest.

Gargles.

(24) *Alum Gargles.*

Alum	grains	60
Water	pint	½

Dilute the above with an equal quantity of warm water when required for use. Useful as an astringent in soft and bleeding gums.

(25) *Astringent Gargles.*

Alum	grains	60
Glycerin	ounces	2
Tannic Acid	drachms	4
Water	pint	½

Dilute as above. Useful in soft and bleeding gums.

(26) *Boric Acid Gargles.*

Boric Acid	drachms	4
Glycerin	ounces	2
Water	pint	½

Dilute as above. Useful for cleaning the mouth in typhoid and other acute fevers.

(27) *Borax and Carbolic Acid Gargles.*

Borax	drachms	5
Glycerin of Carbolic Acid	ounce	1
Water	pint	½

Dilute as above. Useful in diphtheria and other septic conditions of the mouth and throat.

(28) *Chlorate of Potassium Gargles.*

Chlorate of Potassium	drachms	5
Glycerin	ounce	1
Water	pint	½

Dilute as above. Useful in sore throat or ulceration of the mouth and tongue.

(29) *Permanganate of Potassium Gargles.*

Potassium Permanganate	grains	4
Water	pint	½

Dilute as above. Useful in septic conditions of the mouth and throat.

Glycerins

(30) *Carbolic and Tannic Acid Glycerin.*

Tannic Acid	grains	90
Glycerin of Phenol	ounces	2

Useful in chronic septic conditions of the mouth and throat. To be painted on the affected part three or four times a day.

(31) *Perchloride of Iron Glycerin.*

Tincture of Ferric Perchloride	drachm	1
Glycerin	ounce	1

Useful in chronic inflammatory conditions of the mucous membrane of the mouth, throat or nose. To be used as above.

(32) *Mandl's Solution.*

Iodine Powder	grains	6
Potassium Iodide	grains	20
Acid Carbolic	minims	4
Glycerin	ounce	1

To be used as a throat paint in chronic inflammatory conditions of the throat and larynx.

Inhalations.

(33) *Creosote and Carbolic Inhalation.*

Creosote	drachms	4
Carbolic Acid	drachms	4

Add a teaspoonful of this to a pint of boiling water and inhale the steam from a distance for about 15 minutes. Useful in foetid bronchitis.

(34) *Eucalyptus and Turpentine Inhalation.*

Rectified Oil of Turpentine	drachms	4
Eucalyptus oil	drachms	4
Compound Tincture of Benzoin	drachms	4

To be inhaled as above. Useful in bronchial and laryngeal irritation and bronchitis.

(35) *Balsam Tolu and Eucalyptus Inhalation.*

Balsam of Tolu	drachms	4
Oil of Eucalyptus	,,	4
Oil of Turpentine	,,	4
Compound Tincture of Benzoin	,,	4

Useful in chronic bronchitis and pulmonary tuberculosis. It may be inhaled as above with steam, or inhaled from a small wide-mouth bottle in which a piece of absorbent cotton soaked in the fluid is kept.

Liniments.

(36) *Menthol and Eucalyptus Liniment.*

Menthol	grains	20
Camphor	,,	40
Eucalyptus Oil	drachm	1
Methyl Salicylate	ounce	1
Rectified Spirit	,,	1

Rub menthol and camphor in a mortar and add rectified spirit, eucalyptus oil and methyl salicylate and mix well. Useful in painful rheumatic joints and muscles. To be gently rubbed on the affected part morning and evening.

(37) *Opium and Belladonna Liniment.*

Liniment of Opium	ounce	1
Liniment of Belladonna	,,	1
Liniment of Aconite	,,	1

Useful in lumbago, painful joints and muscles and neuralgia. Rub a small quantity on the painful part twice daily.

(38) *Turpentine and Camphor Liniment.*

Liniment of Turpentine	ounce	1
Compound Liniment of Camphor	,,	1
Eucalyptus Oil	,,	1

Useful in bronchitis and inflammation of the respiratory organs.

(39) *Liniment of Lime.*

Olive Oil (recently boiled)	ounces	2
Lime Water	,,	2

Freshly prepared lime water should be used. Useful for the treatment of burns. Pieces of lint or plain gauze soaked in the above liniment are kept on the affected part and changed frequently.

Lotions.

(40) *Antiseptic Lotions.*

1. *Carbolic Acid Lotion.*

Carbolic Acid	drachms	4
Water	pint	1

This gives a strength of 1 in 40 or 2½ % solution.

2. *Perchloride of Mercury Lotion.* (Corrosive Sublimate Solution).

Perchloride of Mercury.	grains	8.75
Water	pint	1

The above solution is 1 in 1000 ; it may be used as such or diluted with an equal quantity of water. Perchloride of Mercury is a powerful poison and its solution is colourless, it should, therefore, be coloured with methylene blue as a precaution against accidents. Many antiseptic fluids are available under different trade names, which may be used diluted according to instructions on the container.

3. *Permanganate of Potassium Lotion.*

Potassium Permanganate	grains	10
Water	pint	1

The above may be used diluted with an equal quantity of water. Condy's Fluid is a strong solution of Permanganate of Sodium (8 grain. to 1 ounce of water) which should be used well diluted.

4. *Boric Acid Lotion.*

Boric Acid	drachms	3
Water	pint	1

This is a mild antiseptic lotion used for washing the eyes or syringing the ears.

(41) *Calamine Lotion.*

Prepared Calamine	drachms	5
Oxide of Zinc	,,	5
Carbolic Acid	,,	2
Glycerin	ounce	1
Rose Water	pint	1

Useful in weeping eczema and other irritating conditions of the skin. Shake it well before use and apply to the affected part on lint.

(42) *Cooling or Evaporating Lotions.*

1. *Chloride of Ammonium Lotion.*

Ammonium Chloride	drachms	5
Dilute Acetic Acid	,,	6
Rectified Spirit	ounces	2
Water	pint	1

Methylated spirit may be used in place of rectified spirit for economy. The affected part to be covered with a two-fold piece of lint soaked in the lotion. In acute inflammations and painful conditions, as in lymphangitis 10 minims of Tincture of Opium (Laudanum) may be added to an ounce of the lotion.

2. *Acetate of Lead Lotion.*

Acetate of Lead (Sugar of Lead)	drachm	1
Dilute Acetic Acid	drachms	4
Water	pint	1

Useful in recent sprains and swollen joints. To be used as above. It may also be used to allay the irritation caused by serum sickness with an addition of 30 minims of Tincture of Opium.

3. *Evaporating Lotion.*

Cologne Water *or* Toilet Vinegar	ounces	2
Water	ounces	10

Useful in fever for cooling the head or sponging the body.

(43) *Eusol Lotion.*

Bleaching Powder (fresh)	drachms	2
Boric Acid	,,	2
Water	pint	1

This should be freshly prepared and stored in a stoppered bottle. It is a powerful disinfectant and is used for cleaning septic wounds.

(44) *Hair Lotion.*

Borate of Soda	drachms	10
Salicylic Acid	,,	2
Tincture of Cantharidin	ounces	4
Bay Rum	,,	3
Rose Water	,,	10
Boiling Water	pints	1½

Useful for promoting the growth of the hair. A small quantity to be used twice daily for massaging the scalp.

(45) *Insect Repellent Lotion.*

Phenol	grains	7
Thymol	,,	10
Tincture of Iodine	drachm	1
Camphor Water	ounce	1

To be applied to exposed parts of the body to repel insects. It is also useful in allaying irritation due to insect-bites.

(46) *Lead and Coal Tar Lotion.*

Solution of Coal Tar	ounce	1
Acetate of Lead Lotion	ounces	20

Useful in chronic eczema.

(47) *Prickly Heat Lotion.*

Perchloride of Mercury	grains	10
Dilute Hydrochloric Acid	drachms	3
Glycerin	ounce	1
Water	pint	1

A small piece of absorbent cotton or lint soaked in the lotion should be gently rubbed on the skin. Perchloride of Mercury is a poison.

(48) *Soothing Lotion.*

Menthol	grains	5
Carbolic Acid	minims	30
Oxide of Zinc	drachms	4
Rectified Spirit	,,	6
Lime Water	ounces	8

Useful in allaying irritation of the skin produced by "woolly bear" caterpillar or insect-bites.

(49) *Thymol Lotion.*

Thymol	grains	90
Rectified Spirit	ounces	3
Glycerin	,,	2
Water	pint	1

Useful in psoriasis, i.e., scaly skin disease, dry eczema and chilblain.

Mixtures.

(50) *Acid Tonic Mixture.*

Dilute Hydrochloric Acid	minims	15
Tincture of Calumba	,,	30
Solution of Strychnine	,,	5
Tincture of Ginger	,,	20
Water to make up to	ounce	1

Useful in atonic dyspepsia in chronic debilitating conditions. One ounce to be taken thrice daily after food.

(51) *Alkaline Mixture.*

Sodium Bicarbonate	grains	20
Citrate of Potassium	,,	20
Light Carbonate of Magnesium	,,	10
Tincture of Belladonna	minims	5
Peppermint Water to make up to	ounce	1

Useful in acidity of the stomach and heart-burn. One ounce to be taken thrice daily half an hour after meals.

(52) *Alkaline Stomachic Mixture.*

Bicarbonate of Sodium	grains	20
Compound Tincture of Gentian	minims	30
Tincture of Nux Vomica	,,	7
Aromatic Spirit of Ammonia	,,	20
Compound Tincture of Cardamoms	,,	30
Water to make up to	ounce	1

Useful in dyspepsia, flatulence, loss of appetite, and debility. To be taken three times a day after meals.

(53) *Ammonium Bromide Mixture.*

Bromide of Ammonium	grains	15
Tincture of Belladonna	minims	8
Syrup of Codeine Phosphate	,,	30
Liquid Extract of Liquorice	,,	40

Spirit of Chloroform	minims	20
Water to make up to	ounce	1

Useful for allaying the paroxysms of whooping cough. $\frac{1}{8}$ part of the above to be given to a child one year old thrice daily. Older children to get proportionately more.

(54) *Ammonium Chloride Mixture.*

Chloride of Ammonium	grains	10
Phosphate of Sodium	,,	20
Bicarbonate of Sodium	,,	20
Taraxacum Juice	minims	30
Syrup of Orange	drachm	1
Peppermint Water to make up to	ounce	1

Useful in chronic congestion of the liver, catarrhal jaundice, and diabetes. One ounce to be taken three times a day after food.

(55) *Anti-vomiting Mixture.*

Oxy-carbonate of Bismuth	grains	15
Bicarbonate of Sodium	,,	20
Tincture of Hyoscyamus	minims	20
Mucilage of Acacia	drachm	1
Water to make up to	ounce	1

Useful in vomiting. One ounce to be given every two or three hours as required. In case of acute poisoning vomiting should not be checked until all poison is eliminated.

(56) *Anti-vomiting Mixture.* (For vomiting of pregnancy).

Tincture of Iodine (mild)	minim	1
Ipecacuanha Wine	,,	1
Water to make up to	ounce	1

Useful in morning sickness of pregnancy. One ounce to be taken in the morning and repeated every hour until four doses have been taken.

(57) *Antispasmodic Mixture.* (For asthmatic attacks).

Iodide of Potassium	grains	7
Nitrate of Potassium	,,	10
Aetheric Tincture of Lobelia	minims	10
Tincture of Stramonium	,,	10
Spirit of Chloroform	,,	20
Water to make up to	ounce	1

Useful for checking the paroxysms of asthma. One ounce to be taken three or four times a day. If the attacks come on during the night the first dose should be taken at 3 p.m.

(58) *Arsenic Mixture.*

Solution of Arsenic (Fowler's Solution)	minims	4
Tincture of Nux Vomica	,,	7
Spirit of Chloroform	,,	20
Water to make up to	ounce	1

Useful in some skin diseases and in leukaemia and other diseases of the blood. One ounce to be taken thrice daily after food. Arsenic is a cumulative poison, the above mixture should, therefore, be stopped for a week or so after taking it for two weeks.

(59) *Arsenic Mixture* (Acid)

Hydrochloric Solution of Arsenic	minims	5
Acid Hydrochloric Dilute	,,	10
Tincture of Nux Vomica	,,	7
Syrup of Orange	drachms	2
Water to make up to	ounce	1

Useful in chronic pellagra or eczema, One ounce to be taken thrice daily after meals.

(60) *Arsenic and Quinine Mixture.*

Hydrochloride of Quinine	grains	6
Acid Hydrochloric Dilute	minims	10
Hydrochloric Solution of Arsenic	,,	5
Syrup of Orange	drachms	2
Water to make up to	ounce	1

Useful in chronic malaria, urticaria, and pemphigus. To be taken thrice a day after meals.

(61) *Aspirin Mixture.*

Aspirin	grains	7
Citrate of Caffeine	,,	5
Camphorated Tincture of Opium	minims	20
Syrup of Codeine Phosphate	,,	30
Water to make up to	ounce	1

Useful in persistent and irritating cough in coryza, i.e., common cold. To be taken thrice daily.

(62) *Astringent Mixture.*

Oxycarbonate of Bismuth	grains	15
Tincture of catachu	minims	30
Compound Tincture of Cardamoms	,,	40
Aromatic Spirit of Ammonia	,,	20
Mucilage of Acacia	drachm	1
Peppermint Water to make up to	ounce	1

Useful in looseness of bowels.

(63) *Bael Mixture.*

Liquid Extract of Bael	minims	90
Liquid Extract of Kurchi	,,	90
Syrup of Orange	drachms	2
Water to make up to	ounce	1

Useful in chronic dysentery. To be taken four times a day.

(64) *Bismuth and Opium Mixture.*

Subnitrate of Bismuth	grains	12
Tincture of Opium (Laudanum)	minims	10
Tincture of Belladonna	,,	7

Spirit of Chloroform	minims	20
Mucilage of Acacia	drachm	1
Peppermint Water to make up to	ounce	1

Useful in painful diarrhoea or vomiting of blood. Not to be taken more than thrice a day and to be discontinued when no longer required.

(65) *Bromide Mixture.*

Bromide of Sodium	grains	10
Bromide of Ammonium	,,	10
Tincture of Hyoscyamus	minims	20
Spirit of Chloroform	,,	20
Water to make up to	ounce	1

Useful in nervous excitement, delirium, and sleeplessness. For sleeplessness one ounce to be taken one hour before bedtime, to be repeated if necessary after three hours. Not more than two doses to be taken during the night.

(66) *Butyl-Chloral Hydrate Mixture.*

Aspirin	grains	10
Butyl-Chloral Hydrate	,,	10
Tincture of Gelsemium	minims	10
Syrup of Orange	drachms	2
Water to make up to	ounce	1

Useful in facial neuralgia. One ounce to be taken four times a day.

(67) *Carminative Mixture.*

Bicarbonate of Sodium	grains	20
Carbonate of Ammonia	,,	3
Tincture of Ginger	minims	40
Tincture of Nux Vomica	,,	10
Aromatic Spirit of Ammonia	,,	20
Peppermint Water to make up to	ounce	1

Useful in flatulent dyspepsia. One ounce thrice daily after meals.

(68) *Cascara Mixture.*

Liquid Extract of Cascara Sagrada	minims	40
Liquid Extract of Liquorice	,,	40
Tincture of Nux Vomica	,,	10
Glycerin	drachm	1
Peppermint Water to make up to	ounce	1

Useful in chronic constipation. One ounce to be taken at bedtime.

(69) *Chlorate of Potassium Mixture.*

Chlorate of Potassium	grains	10
Bromide of Potassium	,,	15
Syrup of Codeine Phosphate	minims	40
Water to make up to	ounce	1

Useful in sore mouth and laryngitis. To be taken thrice a day.

(70) *Cholera Mixture.*

Aromatic Sulphuric Acid	minims	10

Oil of Cajuput	minim	1
Oil of Cloves	,,	1
Oil of Juniper	,,	1
Spirit of Ether	minims	30
Water to make up to	ounce	1

One ounce to be given every two hours in cholera until the more severe symptoms subside. Five or six doses might be given per day.

(71) *Colchicum Mixture.*

Iodide of Potassium	grains	7
Citrate of Potassium	,,	30
Citrate of Lithium	,,	7
Wine of Colchicum	minims	15
Water to make up to	ounce	1

Useful in gout. One ounce to be taken thrice daily.

(72) *Cough Mixture.* (1)

Carbonate of Ammonium	grains	5
Bromide of Ammonium	,,	10
Camphorated Tincture of Opium (Paregoric)	minims	30
Spirit of Chloroform	,,	20
Syrup of Tolu	drachm	1
Camphor Water to make up to	ounce	1

Useful in bronchitis. To be taken thrice daily.

(73) *Cough Mixture.* (2)

Benzoate of Sodium	grains	10
Bromide of Ammonium	,,	10
Tincture of Squills	minims	7
Liquid Extract of Ipecacuanha	,,	15
Syrup of Codeine Phosphate	,,	40
Glycerin	drachm	1
Water to make up to	ounce	1

Useful in chronic bronchitis. One ounce to be taken thrice daily.

(74) *Diaphoretic Mixture.*

Solution of Ammonium Acetate	drachms	2
Spirit of Nitrous Ether	minims	30
Citrate of Potassium	grains	20
Nitrate of Potassium	grains	10
Camphor Water to make up to	ounce	1

One ounce to be taken every three or four hours during fever.

75) *Diuretic Mixture.*

Bicarbonate of Potassium	grains	20
Acetate of Potassium	,,	30
Citrate of Lithium	,,	7
Spirit of Nitrous Ether	minims	30
Tincture of Squills	,,	10
Water to make up to	ounce	1

Useful for increasing the flow of urine in dropsy or in gravel. One ounce to be taken thrice daily.

(76) *Ergot and Quinine Mixture.*

Liquid Extract of Ergot	minims	20
Sulphate of Quinine	grains	5
Dilute Sulphuric Acid	minims	10
Syrup of Orange	drachms	2
Water to make up to	ounce	1

One ounce to be taken immediately after the placenta has come out as a preventive against post partem bleeding. To be repeated if necessary.

(77) *Iron Mixture.*

Citrate of Iron and Ammonium	grains	7
Tincture of Nux Vomica	minims	7
Tincture of Calumba	,,	30
Water to make up to	ounce	1

For anaemia and debility after acute illness and severe bleeding. One ounce to be taken thrice daily after food.

(78) *Iron and Arsenic Mixture.*

Tincture of Perchloride of Iron	minims	7
Hydrochloric Solution of Arsenic	,,	5
Glycerin	,,	30
Water to make up to	ounce	1

Useful in anaemia and leukaemia. To be taken thrice daily after food.

(79) *Iron and Quinine Mixture.*

Tincture of Perchloride of Iron	minims	7
Hydrochloride of Quinine	grains	3
Dilute Hydrochloric Acid	minims	5
Tincture of Nux Vomica	,,	7
Water to make up to	ounce	1

Useful tonic in acne and other skin diseases. One ounce thrice daily after meals.

(80) *Iron Sulphate Mixture.* (Triple Sulphate Mixture).

Ferrous Sulphate	grains	3
Sulphate of Quinine	,,	6
Dilute Sulphuric Acid	minims	8
Sulphate of Magnesium	grains	60
Tincture of Nux Vomica	minims	7
Water to make up to	ounce	1

Useful in anaemia, debility, and enlarged spleen from chronic malaria. One ounce to be taken thrice daily after food.

(81) *Pepsin Mixture.*

Pepsin Powder	grains	5

Dilute Hydrochloric Acid	minims	15
Glycerin	minims	40
Water to make up to	ounce	1

Useful in dyspepsia after acute illness. One ounce with meals thrice daily.

(82) *Potassium Iodide Mixture.*

Iodide of Potassium	grains	5
Citrate of Potassium	,,	20
Aromatic Spirit of Ammonia	minims	20
Water to make up to	ounce	1

Useful in chronic rheumatism. The dose of Iodide of Potassium may be increased by two grains once a week until 15 grains per ounce is reached.

(83) *Quinine Mixture.*

Sulphate of Quinine	grains	6
Dilute Sulphuric Acid	minims	10
Syrup of Orange	drachms	2
Water to make up to	ounce	1

To be taken thrice daily after meals for malaria.

(84) *Quinine and Arsenic Mixture.*

Hydrochloride of Quinine	grains	6
Dilute Hydrochloric Acid	minims	10
Hydrochloric Solution of Arsenic	,,	5
Tincture of Nux Vomica	,,	7
Syrup of Orange	drachms	2
Water to make up to	ounce	1

For recurrent attacks of chronic malaria. To be taken thrice daily after meals and continued for a fortnight.

(85) *Salicylate of Sodium Mixture.*

Salicylate of Sodium	grains	12
Citrate of Potassium	,,	20
Bicarbonate of Sodium	,,	20
Syrup of Orange	drachms	2
Water to make up to	ounce	1

For acute rheumatism and joint pains. The mixture should not be discontinued suddenly when no longer required, but should be taken twice daily for four or five days and once a day for a week before it is discontinued. It is also useful in gallstones.

(86) *Salicylate and Iodide of Potassium Mixture.*

Salicylate of Sodium	grains	12
Iodide of Potassium	,,	5
Citrate of Potassium	,,	20
Aromatic Spirit of Ammonia	minims	20
Water to make up to	ounce	1

Useful in chronic rheumatism. The dose of Potassium Iodide to be increased as in mixture No. 82.

(87) *Sedative Mixture.*

Bromide of Ammonium	grains	15
Chloral Hydrate	,,	10
Tincture of Hyoscyamus	minims	20
Syrup of Orange	drachms	2
Water to make up to	ounce	1

Useful in delirium, mental excitement and sleeplessness. One ounce to be taken one hour before bedtime and repeated once after three hours if necessary.

(88) *Sedative Mixture for Sea-sickness.*

Bromide of Potassium	grains	15
Bicarbonate of Sodium	,,	20
Tincture of Belladonna	minims	7
Aromatic Spirit of Ammonia	,,	20
Water to make up to	ounce	1

For the relief of nausea in sea-sickness. One ounce to be taken as soon as the symptoms of sea-sickness appear and repeated three times during the day.

(89) *Stimulant Mixture.*

Brandy	drachms	2
Aromatic Spirit of Ammonia	minims	30
Spirit of Ether	,,	30
Tincture of Nux Vomica	,,	10
Peppermint Water to make up to	ounce	1

One ounce to be given in shock and low conditions of circulation and repeated as required. In collapse from bleeding it should be given after all bleeding has stopped.

(90) *Trinitrin Mixture.*

Solution of Trinitrin	minim	1
Nitrite of Sodium	grain	1
Bromide of Potassium	grains	10
Spirit of Chloroform	minims	20
Water to make up to	ounce	1

Useful in anginal attacks and other painful conditions of the heart from constant high blood-pressure. One ounce to be taken as soon as an attack of angina is threatened and repeated if necessary. It takes a little longer to act than the inhalation of Nitrite of Amyl, but its effect is not so transient.

(91) *White Mixture.*

Light Carbonate of Magnesium	grains	15
Sulphate of Magnesium	drachm	1
Peppermint Water	ounce	1

Useful as an antacid and a mild aperient in acidity of the stomach. As a mild aperient one or two ounces might be taken in half a tumblerful of water one hour before breakfast.

Mixtures for Children.

The dose of the following mixtures is one drachm or 60 minims for a child six months to one year old. It may be reduced or increased in proportion to the age of the child according to the formula given under "Dosage".

(92) *Aperient Mixture.*

Light Carbonate of Magnesium	grains	16
Syrup of Rhubarb	minims	60
Dill Water to make up to	ounce	1

One drachm to be given at bedtime or twice or thrice a day for constipation.

(93) *Alkaline Mixture.*

Bicarbonate of Sodium	grains	20
Citrate of Potassium	,,	20
Tincture of Belladonna	minims	10
Peppermint Water	ounce	1

Useful in bed-wetting when the urine is very acid in reaction. One drachm to be given three times a day commencing at 2 p.m.

(94) *Bael Mixture.*

Syrup of Bael	minims	90
Tincture of Opium (Laudanum)	,,	6
Dill Water	ounce	1

Useful in painful dysentery. Before commencing give a dose of Castor Oil. Not more than three doses of one drachm each to be given during the day.

(95) *Bromide Mixture.* (Sedative)

Bromide of Potassium	grains	16
Tincture of Hyoscyamus	minims	24
Syrup of Orange	drachms	2
Water to make up to	ounce	1

A sedative mixture useful in night terrors in children. One drachm to be given thrice daily commencing at 3 p.m. to a child 3 years old.

(96) *Carminative Mixture.*

Bicarbonate of Sodium	grains	16
Compound Tincture of Cardamoms	minims	24
Aromatic Spirit of Ammonia	,,	16
Dill Water to make up to	ounce	1

Useful in distended stomach, flatulence and colic. One drachm to be given thrice daily after feeding.

(97) *Castor Oil Mixture.*

Castor Oil	drachms	3
Mucilage of Acacia	drachm	1
Peppermint Water to make up to	ounce	1

As a purgative one to three drachms might be given according to age. In dysentery with plenty of mucus one drachm might be given every three hours until the mucus stops and fecal matter appears.

(98) *Cough Mixture.*

Carbonate of Ammonium	grains	5
Wine of Ipecacuanha	minims	16
Tincture of Squills	,,	12
Syrup of Tolu	,,	40
Camphorated Tincture of Opium (Paregoric)	,,	30
Camphor Water	ounce	1

For bronchitis one drachm to be given three times a day.

(99) *Diaphoretic Mixture.*

Solution of Ammonium Acetate	drachms	1½
Spirit of Nitrous Ether	minims	30
Citrate of Potassium	grains	16
Ipecacuanha Wine	minims	16
Camphor Water to make up to	ounce	1

One drachm to be given every three or four hours during fever. A saline purgative is advisable before commencing the mixture.

(100) *Diarrhoea Mixture.*

Oxycarbonate of Bismuth	grains	16
Bicarbonate of Sodium	,,	20
Compound Tincture of Cardamoms	minims	24
Mucilage of Acacia	drachm	1
Dill Water to make up to	ounce	1

For diarrhoea one drachm to be given three or four times daily as required.

(101) *Dyspepsia Mixture.*

Bicarbonate of Sodium	grains	20
Citrate of Sodium	,,	20
Compound Tincture of Gentian	minims	20
Aromatic Spirit of Ammonia	,,	16
Dill Water to make up to	ounce	1

For dyspepsia and sour vomiting one drachm to be given thrice daily after meals.

(102) *Iron Phosphate Mixture.*

Syrup of Ferrous Phosphate	minims	30
Hypophosphite of Calcium	grains	8
Spirit of Chloroform	minims	16
Water to make up to	ounce	1

For debility in rickets, anaemia, and scrofula one drachm thrice daily after meals.

(103) *Iron Tonic Mixture.*

Citrate of Iron and Ammonium	grains	8
Tincture of Calumba	minims	20
Spirit of Chloroform	,,	16
Water to make up to	ounce	1

For anaemia and general debility following acute infectious diseases one drachm to be given thrice daily after food.

(104) *Quinine Mixture.*

Hydrochloride of Quinine	grains	8
Dilute Hydrochloric Acid	minims	12
Syrup of Orange	drachms	2
Water to make up to	ounce	1

For malarial fever one drachm to be given thrice daily after food.

(105) *Whooping Cough Mixture.*

Bromide of Ammonium	grains	12
Tincture of Belladonna	minims	12
Liquid Extract of Liquorice	,,	40
Syrup of Tolu	,,	40
Syrup of Codeine Phosphate	,,	30
Chloroform Water to make up to	ounce	1

For checking the paroxysms of whooping cough one drachm to be given four times a day.

Ointments.

Ointments are soft preparations consisting of active drugs in a finely divided state mixed with soft paraffin, lanolin or some other medium. They are used externally spread on the skin and are meant to act locally or get absorbed and produce a general effect on the body. Most of those described below are official preparations and can be purchased ready made from any chemist.

(106) *Boric Ointment.*

It is midly antiseptic and is applied to the raw surface on a piece of clean lint or gauze.

(107) *Carbolic Ointment.*

It is used in the same way as above but is stronger.

(108) *Chrysarobin Ointment.*

It is useful in ringworm, a few applications being enough to bring about a cure. An addition of 20 grains of Ammoniated Mercury and 30 minims of Solution of Coal Tar to an ounce increases its efficiency. Chrysarobin stains the skin and clothes. The part should be cleaned before applying it.

(109) *Gall and Opium Ointment.*

It is an astringent ointment and is used for inflamed and bleeding piles. A small quantity is introduced into the rectum and allowed to remain there for some time.

(110) *Hamamelis Ointment.*

It is also used as an astringent in bleeding piles alone or mixed with the above.

(111) *Mercury Ointment.* (Blue Ointment.)

This contains metal mercury in a finely divided state which is easily absorbed through the skin. It was at one time used in syphilis but the preparations of arsenic and bismuth which have a more powerful effect on the disease have displaced mercury. Recently penicillin and chloromycetin are used with good results.

(112) *Red Iodide of Mercury Ointment.*

This is used as a counter-irritant in deep inflammatory conditions of bones and joints and for enlarged spleen. It is less irritating when mixed with an equal quantity of the Mercury Ointment.

(113) *Ammoniated Mercury Ointment.* (White Precipitate Ointment.)

It is useful in fungus diseases of the skin and in allaying irritation, especially in the groin and armpit. An addition of 20 grains of Salicylic Acid to an ounce of the ointment increases its efficacy.

(114) *Penicillin Ointment.*

It is used in suppurative conditions of the skin.

(115) *Yellow Mercuric Oxide Ointment.*

It is used in marginal inflammation of the eyelids. The ointment is applied with the tip of the finger after cleaning the lids with soap and warm water.

(116) *Sulphur Ointment.*

It was used in the treatment of scabies but Mitigal, a liquid organic compound of sulphur, and another preparation called Benzyl Benzoate have displaced it, being more rapid and more effective than sulphur:

(117) *Sulphur and Zinc Oxide Ointment.*

Thirty grains of Oxide of zinc added to an ounce of Sulphur Ointment is useful in allaying the irritation of scabies.

(118) *Sulphur and Salicylic Acid Ointment.*

Precipitated Sulphur	grains	30
Salicylic Acid	,,	10
Beta Naphthol	,,	10
Lanolin	ounce	1

To be used for massaging the scalp for the restoration of hair.

(119) *Tar Ointment.*

It may be used alone or with 20 grains of Salicylic Acid to the ounce for fungus disease of the scalp. It should be applied after washing the scalp with soap and warm water.

(120) *Zinc Oxide Ointment.*

It is soothing to the skin and is used for eczema or other irritating conditions, alone or mixed with 20 grains of Boric Acid and 30 of calomel to the ounce.

Paints or Pigments.

A paint is a liquid preparation used externally on the skin or mucous membrane for its local action. Some are described under Glycerins.

(121) *Salicylic Acid Paint for Corns.*

Salicylic Acid	grains	60
Extract of Cannabis Indica	grains	32
Rectified Spirit	drachm	1
Ether	drachms	3
Collodium Flexile	,,	5

It is useful for removing corns. The skin surrounding the corn is protected by a thick layer of vaselin and the corn painted twice daily with the above paint which is allowed to dry. After a few days the corn will come off.

(122) *Perchloride of Mercury and Salicylic Paint.*

Perchloride of Mercury	grain	1
Salicylic Acid	grains	9
Phenol	,,	10
Glycerin	drachms	2

Useful in ringworm. To be painted twice daily on the affected part.

Pills.

(123) *Aloin and Euonymin Pill.*

Aloin	grain	$\frac{1}{2}$
Extract of Nux Vomica	,,	$\frac{1}{4}$
Extract of Belladonna	,,	$\frac{1}{4}$
Extract of Euonymin	,,	1
Extract of Gentian	grains	2

One pill as above to be taken after dinner for chronic constipation.

(124 *Aperient Pill.*

Dry Extract of Cascara Sagrada	grains	2
Extract of Nux Vomica	grain	$\frac{1}{4}$
Extract of Belladonna	,,	$\frac{1}{4}$
Extract of Gentian	grains	2

Useful in chronic constipation. One pill to be taken twice or thrice daily after meals as required.

(125) *Iron Pill.* (Blaud's Pill).

It is an official preparation and its dose is from 5 to 15 grains. It is advisable to start with the smallest dose and increase it gradually until the limit of tolerance is reached. All iron preparations are taken after meals as they otherwise irritate the stomach. They are constipating and require an occasional dose of saline purgative. They stain the stools black.

(126) *Iron Tonic Pill.*

Iron Pill	grains	5
Extract of Aloes	,,	1

Sulphate of Quinine	grains	2
Extract of Nux Vomica	,,	¼
Extract of Belladonna	,,	¼

One pill to be taken twice or thrice daily after meals. If the pill is too large to swallow it might be divided into two before taking.

(127) *Mercury Purgative Pill.*

Mercury Pill (Blue Pill)	grains	4
Dry Extract of Euonymin	grain	1
Extract of Nux Vomica	,,	¼
Extract of Belladonna	,,	¼

Useful in sluggish liver and dyspepsia due to excess in eating and alcoholic drinks. One pill at bedtime followed the next morning by a saline purgative.

Plasters.

A plaster is a preparation containing an active drug mixed with a sticky substance spread on linen, silk, wash leather, or some other material and applied to the skin to which it sticks if warmed a little. It produces local effects on the skin, or a general effect on the body by absorption through the skin. These are mostly official preparations and can be had from chemists in the required size.

(128) *Belladonna Plaster.*

Useful in deep congestion or inflammatory conditions of the breast during lactation.

(129) *Cantharidin Plaster.*

It is applied over chronic deep-seated inflammatory conditions to produce a vesicant effect. It is removed after six to eight hours and the part treated with boric fomentation, which causes the small vesicles to join and form one large blister. If prolonged irritant effect is required, the blister is opened and the skin over it removed under proper antiseptic precautions and the raw surface dressed with suitable dressing.

(130) *Menthol Plaster.*

It is soothing to the nerve endings in the skin and is useful in neuralgic pain, lumbago, sciatica, etc.

(131) *Mustard Plaster.*

This is a familiar and most commonly employed household remedy for various ailments. It is useful for the relief of deep-seated pain in joints, lumbago, sciatica, pleurisy, etc. In persistent hiccough or vomiting it affords relief when applied to the pit of the stomach, and acts as a circulatory stimulant when applied over the heart area. Fresh powder should be used for the purpose. A thin paste is made with a little warm water in a saucer, which is evenly spread on a piece of muslin and the cloth side is applied to the skin. It is allowed to remain there for fifteen to twenty minutes or until there is redness and burning.

(132) *Resin Plaster.*

It is chiefly used as an adhesive plaster to hold small surgical dressings in place or fix splints to limbs before a bandage is applied.

Powders.

Powders consist of finely pulverised dry drugs which are not suitable for administration in a liquid form or which are meant for external use only. Those for internal use are mixed with or dissolved in a small quantity of water before swallowing.

(133) *Antacid Powder.*

Sodium Bicarbonate	grains	20
Light Carbonate of Magnesium	,,	10

Useful in acidity of the stomach and acid dyspepsia. One powder as above to be taken in half a cupful of water one hour before breakfast and repeated during the day if necessary.

(134) *Aromatic Chalk Powder with Opium.*

It is an official powder and contains 2½% of opium and is useful in diarrhoea. Twenty to thirty grains to be taken and repeated, if necessary, after four hours. No more than three powders to be taken in twenty-four hours.

(135) *Aspirin and Caffeine Powder.*

Aspirin	grains	7
Citrate of Caffeine	,,	3

Useful for the relief of headache, joint pains, muscular rheumatism, cold, fever and neuralgic pains. To be repeated after three hours, if necessary, but should not be taken too frequently.

(136) *Bismuth and Pepsin Powder.*

Oxycarbonate of Bismuth	grains	10
Pepsin Powder	,,	5

Useful in dyspepsia. One powder to be taken thrice daily after meals. Five grains of taka-diastase may be added to the powder for the digestion of starch.

(137) *Bismuth with Chalk and Opium Powder.*

Bismuth Sub-nitrate	grains	10
Aromatic Chalk Powder with Opium ..	,,	15

Useful in diarrhoea. One powder twice or thrice daily as required.

(138) *Boric Acid and Zinc Oxide Powder.*

Boric Acid	grains	60
Oxide of Zinc	,,	60
Oxycarbonate of Bismuth	,,	30
Starch Powder	drachms	4½

To be used externally as dusting powder for allaying irritation of the skin due to excessive perspiration in hot weather.

(139 *Compound Ipecacuanha Powder.* (Dover's Powder)

It is an official preparation and is useful as a diaphoretic and expectorant in acute cold and catarrhal conditions of the throat and larynx. The dose for an adult is from 5 to 10 grains according to age and physical condition. It contains 10% of opium and therefore should not be repeated too often. At one time it was much used for dysentery but has now been superseded by emetine injections and sulpha drugs. It may be used when these are not available.

(140) *Prickly Heat Powder.*

Boric Acid	drachm	1
Oxide of Zinc	,,	1
Calomel	grains	30
Starch Powder	drachms	6

It is for external use and is dusted on the affected parts after bath.

(141) *Quinine and Acid Salicylic Powder.*

Quinine Hydrobromide	grains	5
Salicylic Acid	,,	5
Aspirin	,,	5

Useful in neuralgia and cold. One powder to be taken thrice a day.

(142) *Sodium Citrate Powder.*

Citrate of Sodium	grains	2
Bicarbonate of Sodium	,,	2

Useful in dyspepsia of children. One powder dissolved in water and given three or four times a day after feeding.

(143) *Teething Powder.*

Mercury and Chalk Powder. (Grey Powder)	grain	½
Bicarbonate of Sodium	grains	2

Useful in disturbances in children during teething and green diarrhoea. One powder to be given twice daily until the colour of the motions improves.

INJECTIONS

Many drugs, instead of being given by the mouth, are administered for special reasons by injections. There are several methods which are known according to the route, viz. intradermic, i.e., into the skin ; hypodermic or subcutaneous, i.e., under the skin ; intramuscular, i.e., into the substance of a muscle ; intravenous, i.e., within the lumen of a vein ; and intraspinal, i.e., within the sheath of the spinal cord.

Intradermic injections are usually given to find the reaction of a substance in allergic subjects. The hypodermic method is selected when a very minute dose of a potent drug is to be administered for rapid action or for its local effect to produce temporary loss of sensation in the part for performing an operation on a limited area without producing unconsciousness. For this purpose cocaine or some synthetic drugs having the same effect are used. The intravenous route is used for certain drugs which have a specific action on the tissues and which are unsuitable for administration by the mouth as they get decomposed in the stomach or cause irritation of the organ. When given intravenously they diffuse quickly throughout the body and act rapidly. The intramuscular route is chiefly selected when a slow continuous action of a drug is required, the drug being slowly absorbed to maintain a constant level of concentration in the blood. Intraspinal injections are given at the lowest end of the spine, where the spinal cord breaks up into the last set of nerves, to produce anaesthesia in the lower part of the body without producing unconsciousness. It is not suitable for operations in the upper part of the body, because if injected higher up the muscles of respiration would be paralysed causing death from asphyxia.

All these methods of injection require special skill, experience and some anatomical knowledge and precautions against accidents. Even the hypodermic injection, which is simple to administer, requires great care and usual precautions otherwise serious, if not fatal, consequences may result. It should not be resorted to except when it is absolutely necessary in the absence of medical help and when the operator is quite sure of meticulously carrying out all the instructions given below.

Hypodermic Injections. The following equipment is necessary for giving a hypodermic injection: a hypodermic syringe with two hollow needles, a vessel to boil the syringe in, a pair of dressing forceps, some pieces of lint, cotton-wool, a spirit lamp with a stand or a kerosene stove, carbolic lotion (No. 40), tincture of iodine, and a small slip for sharpening the needles. The syringes are available in different sizes and are marked in minims or cubic centimetres; one with a capacity of 30 minims or 2 c.c. is a convenient size. An all-glass, or a "Record" syringe is generally used as it is easy to clean and sterilize. The needle should have a sharp point with a good bevel, as a blunt point is difficult to insert and causes pain.

The syringe and the needles should be cleaned with a piece of lint so as to remove any oil or vaselin on them, and the lotion drawn several times into the syringe through the needle, and the lotion washed out by drawing clean water in the same way. The syringe is now ready to be sterilized. It should be taken to pieces and all parts, including the needles, placed in the vessel separately on a piece of lint so that the glass of the syringe does not come into direct contact with the vessel, as it is liable to crack by the uneven application of heat to it. The vessel is then filled with water so as to cover the syringe completely and placed on the stove. It should be kept there for fully ten minutes after the water begins to boil; it is much safer to keep it a little longer. It is then removed from the stove and allowed to get cool. The process of cooling can be hastened by placing the vessel in a basin of cold water, care being taken to prevent any water from the basin getting into the vessel containing the syringe, otherwise it will have to be boiled again. The operator washes his hands with soap and water using a brush to scrub well the skin and nails, and without using a towel to dry, puts his hands in a bowl of lotion for a few minutes. After this the hands should not come in contact with anything that is not sterilized. The syringe is then taken out of the vessel with the pair of forceps and the parts assembled without touching the needle with the fingers. The spare needle is also boiled in case one drops down while fixing it to the syringe; the dropped needle should not be touched with the hand or used again until it is thoroughly cleaned and boiled. Having got the syringe ready the next step is to prepare the solution for injection. Most of the drugs used for hypodermic injection are now available in glass capsules and properly sterilized ready for injection ; all that is needed is to sterilize the outside of the capsule with tincture of iodine, and break the narrow part of the neck with a file supplied with the capsule. The file is first sterilized by passing it several times through the flame or by keeping it in tincture of iodine.

Once the syringe is taken out of the vessel in which it is sterilized, it should not touch anything that is not sterilized. The site to be injected is sterilized by the application of strong tincture of iodine twice with an interval of a few minutes. The skin of the part is then lightly pinched between the thumb and the index finger of the left hand so that it is raised a little from the underlying muscles. Usually the skin of the back of the arm or the abdomen is used, but the injection can be made in any part of the body where the skin is not very thick. The syringe is held in the right hand in such a way that the barrel with the piston drawn out rests on the last three fingers and the nozzel in which the needle is inserted is held between the thumb and the index finger, the point of the needle is then pushed sharply through the fold of the skin raised with the left hand parallel with the surface, so that almost the whole of the needle is inserted just under the skin. The piston is then pushed home slowly until the whole of the contents of the syringe is emptied, and the needle then withdrawn. If the needle is sharp-pointed it enters the skin readily and the patient does not feel any pain.

After use the syringe is washed with the same water in which it was boiled, dried thoroughly with a piece of lint, and all metal parts smeared with vaselin including the needles after they are cleaned and dried by drawing air several times through them. A thin wire which is supplied with the syringe is lubricated with vaselin and inserted into the lumen of the needle to prevent it from getting choked with rust.

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